The RUBBER AGE

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High Pivotal Price and Reclaimed Rubber Wrecked Restriction, Says Official

Blame for Fatal Boosting of the Demanded Price for British Rubber is Placed by Under-Secretary Ormsby-Gore on Lord Stevenson and Advisory Committee; Government is Still Target of Wide Criticism — Production This Year Now Expected to Exceed Consumption by at Least 13,000 Tons

IN A revealing speech at Ipoh, Malaya, parts of which he has since endeavored to retract, Mr. Ormsby-Gore, British Under-Secretary of State for the Colonies, has attributed the failure of rubber restriction, and its final cancellation, to the high pivotal price and the rapidly growing use of reclaimed rubber. The British official, who is now on a tour of investigation in the East, made a particular effort to stop the rumor that protests from the United States had been the primary cause for Prime Minister Baldwin's action with regard to the famous rubber legislation.

"America had not been thought of or discussed when the cabinet considered the question of an inquiry," Mr. Ormsby-Gore said. "The cabinet was told that a still further cut in exports was necessary to arrive at a new pivotal price. Malaya accepted such a cut, but it was not sure that Ceylon would have agreed. The next factor which worried the cabinet was the increasing money being put into the reclaiming industry, the price of plantation rubber making reclaiming profitable."

In reply to a direct question, the Under-Secretary said that, undoubtedly, the raising of the pivotal price had wrecked restriction. This unwise action, he contended, was not the fault of the Colonial Office, but was the fault of Lord Stevenson and the advisory committee, made up chiefly of men interested in the plantations.

The views of Mr. Ormsby-Gore, although they are the most concrete official opinion given out since it was announced that restriction would be cancelled at the end of next October, were met with ridicule in London, where various interests insisted that the Colonial Office had been misled with regard to the influence of reclaimed rubber. The matter of twice increasing the pivotal price above the fair price which was incorporated originally in the Stevenson scheme was passed over, surprisingly enough, as it has been in the past.

Condemnation of the British government for its action with regard to the rubber legislation has been exceedingly bitter. The committee which undertook the investigation preceding Mr. Baldwin's announcement was criticized in particular. The point that none of the members was familiar with the rubber industry was stressed, as was the secrecy and haste with which the inquiry was conducted and the decision made.

Among the political critics were Mr. Lloyd George and Ramsay MacDonald, who denounced the manner in which the Baldwin government handled, or mis-handled, the rubber question. Mr. MacDonald estimated that by removing restriction so bluntly, the government had taken no less than £130,000,000 ($650,000,000) out of the pockets of British investors. He said that experts had told him that the value of rubber stocks on hand had been diminished by £30,000,000, while the market value of shares had been halved, meaning an additional loss of £100,000,000.

The more seasoned criticism centers around the fact that restriction was cancelled when being applied to the maximum. It is felt that any rearrangement which would have brought about a 100 per cent release before the scheme was suspended would have resulted in much less dislocation of the industry.

In the face of the hostile criticism, both outside and inside official circles, the Prime Minister has remained silent, which has, in turn, brought more criticism. Attention has been drawn sarcastically to the fact that the speech of Mr. Ormsby-Gore, referred to above, is the most explicit official explanation which has been made.

With the first wave of confusion past, rubber interests have naturally turned to an appraisal of the rubber situation from a statistical standpoint. It is generally conceded that all British estates which can possibly do so have already begun to produce on a 100 per cent basis, with the idea of shipping the extra rubber on November 1, when the ban is lifted. Symington & Sinclair, well-known rubber brokers of London, have changed their world production estimate for 1928 from 584,000 tons, made at the first of the year, to 668,000 tons. This firm also believes that the lower price of crude rubber will stimulate consumption and they have accord-

Another Wreck on the Main Line

This cartoon from the London "Evening News" is based on Mr. Lloyd-George's Comparison of Mr. Baldwin to a ticket collector who has wandered into the signal box

ingly raised their estimate on that side from 625,000 tons to 655,000 tons. These estimates mean an increase of 13,000 tons in the already ample stocks, instead of a decrease of 41,000 tons. This authority figures on a decrease of 30,000 tons this year in the consumption of reclaimed rubber in the United States, this amount being displaced by crude rubber at its new low price.

Efforts of the British and Dutch rubber growers to get together in an unofficial system of co-operation, probably with regard to marketing of rubber, have continued, but appear so far to have been futile. The significant fact has been pointed out by many observers that in the present instance the Dutch delegation has visited London in the hope of finding a basis for co-operation, whereas in earlier cases the British have had always to take the initiative and journey to The Netherlands for the conferences. Optimism that any effective alliance can be worked out seems to have faded, although the secretary of the Rubber Growers' Association in London has pointed out that negotiations cannot be said to have broken down.

A meeting of Dutch, Belgian and French rubber plantation interests was held at Brussels on April 24 and 25, but according to a cabled report from the American commercial attache, it resulted only in a general discussion of the situation, and no decision was made other than to hold another meeting at a later date.

Reclaimers Expected to Fight

Recognition that the rubber reclaimers may not be as easily displaced by low-priced rubber as some believe has been accorded by some of the authorities. Among them is the chairman of the Java Amalgamated Rubber Estates, Ltd., who at the annual meeting of his company pointed out that the competition between crude and reclaimed will not be severe, and that the reclaimers will improve the quality and lower the prices of their products to save their market. "In order to insure the partial substitution of plantation for reclaimed rubber," this authority said, "owners of estates must, I think, be prepared to accept low prices for a long period."

Present crude rubber prices are also being depended upon to discourage the production of native and wild rubber on the assumption that the native producer will be loath to tap so energetically for the reduced return which he will receive. The reply to those who minimize this factor is that native producers invariably reduce their output when prices decline sharply, but that their slowing-up is only temporary, and after a few months they will again be making the best of the situation by tapping as heavily as before prices fell.

The crude rubber market in New York has remained dull, with spot prices ranging fractionally above 17 cents. On the Rubber Exchange of New York a small increase has been made in the premium on futures. At the end of last week prices, both on the exchange and outside markets, tended to firm up, being attributed to the re-entry of factory interest, which has been slight since the announcement that restriction would end.

Rubber Division, A.C.S., Holds Group Meetings in Two Cities

Akron Meeting, Attended by 475 Members and Guests, Holds Discussion on Mill Room Equipment and Operations—New York Group Hears Paper and Sees Motion Picture on Guayule—Other Group Meetings Scheduled.

THE Akron and New York groups of the Rubber Division, American Chemical Society, held meetings in April as a continuation of the division's program for bringing rubber technologists together more frequently than the semi-annual divisional meetings. In each case, the meeting was the second one for the group. The Boston group held its first meeting on May 9. The second meeting of the Los Angeles group will be held on May 11.

The Akron group meeting, held on April 26 in the Goodyear general office dining room, was probably the largest technical meeting ever held in that rubber center. Between 475 and 500 attended. Following dinner, an interesting program was given, which had been prepared under the direction of W. H. Fleming. Dr. H. A. Winkelman, chairman of the group, presided. The general subject for the evening was mill room equipment and operations.

The principal speaker was N. W. Pickering, manager of the roll department of the Farrel-Birmingham Company, Inc. The subject of his paper was "Chilled Iron Rolls in the Rubber Industry." The speaker explained at length the manufacture and use of such equipment. His paper, like the shorter papers which followed, is printed in full in this issue of THE RUBBER AGE. The shorter papers on allied subjects were read by P. S. Shoaff, Goodyear; Erle Zimmerman, Firestone; J. E. Noonan, Goodrich, and P. P. Crisp, Miller.

Second Meeting in New York

The second meeting of the New York group was held on April 25 at the Town Hall Club, with approximately 150 present. Dr. W. A. Gibbons, chairman of the group, presided. The meeting began with dinner, which was followed by a paper and motion pictures on guayule rubber. The paper disclosed recent advances in the preparation of guayule rubber, and was by Dr. David Spence, vice-president of the Continental Rubber Company. Since Dr. Spence had been delayed on a western trip and was, therefore, unable to attend the meeting as planned, his paper was read by Dr. Harry L. Fisher. It is printed in this issue of THE RUBBER AGE.

Dr. Spence was also scheduled to present and explain Continental's four-reel motion picture of guayule production and cultivation, but in his absence his place was taken by George H. Carnahan, president of the company. Two reels of the four were devoted to the gathering of the shrub and the extraction of the rubber in Mexico, while the other two showed the progress of guayule cultivation in California.

The Boston group meeting will be reported in the next issue of THE RUBBER AGE. The program calls for four papers on rubber chemistry by well-known technologists in the New England district.

A list of those present at the New York meeting on April 25 is as follows:

John A. Adkins, American Hard Rubber; Max Alport, Wolff-Alport Chemical Corp.; C. A. Anderson, Manhattan; R. H. Anderson, Manhattan; Don E. Andrews, General Rubber.

F. H. Banbury, Farrel-Birmingham; F. C. Batchellor, Ault & Wiborg; D. J. Beaver, Combustion Utilities; H. Behr; Robert Berkowitz, Metal Hose & Tubing; E. W. Berry, Duratex; N. E. Bowers, American Hard Rubber; H. A. Braendle, Binney & Smith; J. Breckley, Dovan; G. W. Brown, Okonite.

S. M. Cadwell, U. S. Rubber; G. H. Carnahan, Intercontinental; David Carnegie, Jr., Duratex; W. C. Carter, Pequanoc; R. E. Casey, Naugatuck; George Cherin, Dovan; K. C. Chew, Kenyon; M. H. Clark, Johns-Manville; D. F. Clash, Whitehead; D. H. Comes, Farrel-Birmingham; W. H. Cope, Vanderbilt; G. T. Cottle, General Cable; D. F. Cranor, Binney & Smith; A. S. Cullum, Grasselli.

J. J. De Mario, Manhattan; J. E. Davis; Wm. R. Dolton, Murray; W. E. Downs, Vulcan Proofing; J. Driscoll, Johns Manville; W. A. Ducca, American Hard Rubber.

A. J Edge, L. A. Edland, Vanderbilt; W. A. Evans, Vanderbilt.

I. T. Faucett, Safety Cable; C. P. Finck, Eberhard Faber; Chas. A. Finckel, Okonite; Harry L. Fisher, U. S. Rubber; K. H. Fulton, Combustion Utilities.

G. H. Ganzhorn, U. S. Rubber; W. C. Geer; W. A. Gibbons, U. S. Rubber; E. H. Grafton, Murray Rubber; Walter H. Grote, Phelps; George E. Grove, N. J. Zinc; Joseph E. Guenter, American Hard Rubber.

Joseph W. Harrison, Thermoid; C. R. Haynes, U. S. Rubber; A. W. Holmberg, U. S. Rubber; A. C. Howard, N. Y. Belting & Packing; Kenneth E. Hunt, American Hard Rubber.

W. Jackson, Vanderbilt; D. E. Jones, American Hard Rubber; A. E. Jury, U. S. Rubber.

M. M. Kahn; Frederick R. Kaimer, General Electric; L. I. Kayhart, Pequanoc; A. W. Keen, U. S. Rubber; A. R. Kemp, Bell Telephone; T. P. Keller, Combustion Utilities; C. K. Kennedy, F. R. Henderson Co.; G. T. M. Keulemans, F. R. Henderson Co.; C. G. Kirov, Woven Steel Hose & Rubber; John Klemans, Okonite.

Charles Lahart, Anchor Cap & Closure; Wm. F. Lamela, Okonite; Arthur J. Lang, Dovan; R. C. Lang; Fred V. Larkin, R. & H.; P. A. Lasselle, Bell Telephone; J. A. Lee, Bell Telephone; G. Leistensnider, R. & H.; G. E. Lewis, Jr., Vulcan Proofing; E. A. Loy, Eberhard Faber.

R. L. McClenahan, N. J. Zinc; R. H. McLeod, Manhattan; N. Gibson Madge; Cornelius Magu, Schrader; E. W. Mason, Grasselli; F. J. Maywald; J. P. Millwood; W. M. Morse, India Rubber World; Harold R. Murdock.

Wm. Nahouse, New York Belting & Packing; A. H. Nellen.

Carl F. Ogren, Thermoid; John J. O'Hare, American Rubber Products; Thomas O'Meara, Metal Hose & Tubing.

P. L. Palmerton, THE RUBBER AGE; Martin P. Parker, Huber; G. E. Perry, F. R. Henderson Co.; John Pierro, Okonite; J. J. Pierro, Okonite; Peter P. Pinto, THE RUBBER AGE; Wm. B. Plummer, Combustion Utilities; William Poole, N. Y. Insulated Wire.

B. R. Rhoades, Rhoades Metaline; Chas. E. Reynolds, Vulcan Proofing; Saul Robinson, American Lead Pencil; B. C. Ross, Vanderbilt; C. R. Rubidge, N. Y. Belting & Packing; W. F. Russell, Norwalk; J. V. Ryan, Whitehead; John P. Ryzowitz, Okonite.

Arnold S. Schavoir, Schavoir; Fred H. Schavoir, Schavoir; Franz C. Schmelkes, Wallace & Tiernan; E. W. Schwartz, General Electric; H. M. Sellers; W. H. Shields, Moore & Munger; H. W. Sidnell, Phelps; Frank Simons, Kenyon; A. S. Slack, du Pont; Lee T. Smith, Hercules Powder; Robert Spreat, Thermoid; George C. Strachan, American Hard Rubber; H. T. Stowe, U. S. Rubber; A. J. Suttie, Hercules Powder.

F. E. Traflet, Pequanoc; Vladmir Tuma, U. S. Rubber.

G. Van Nimwegen, American Hard Rubber; J. de C. Van Etten, Vansul.

M. L. Weiss, Dovan; W. H. Whitcomb, U. S. Rubber; Richard R. Whitehead, Crescent Insulated Wire; W. A. Whitenack, Goodrich; C. S. Williams, R. & H.; N. R. Wilson, Rare Metals; Harry W. Wolff, Wolff-Alport; C. J. Wright; G. J. Wyrough, Murray.

E. S. Youmans; Robert Youmans, Vanderbilt; John Young.

Recent Scientific Advances In Connection with Guayule

David Spence

Further Research Has Established the Important Fact That the Rubber in Guayule Shrub Does Not Exist in the Cells in Form in which It is Recovered, But as a Colloidal Suspension in the Plant Juice.

By DAVID SPENCE[1]

Vice-President, Continental Rubber Company

RECENT scientific advances in connection with guayule have been made along botanical and biological, as well as chemical lines. The work of Dr. W. B. McCallum[2] in definitely identifying many different varieties of guayule and subsequently propagating in California a few selected strains that best respond to intensive cultivation marks a distinct advance in the scientific development of this subject, and his successful efforts in seed selection and propagation will always stand as a monument to his skill and perseverance in this connection. His work is not only of fundamental importance in any study of the effect of environment on natural growth, but also has clearly shown that the available rubber or yield of rubber from the shrub is determined to a large extent by the variety of shrub which is cultivated. The bridge between mariola, with its three per cent of available caoutchouc, and the best varieties of guayule as now growing in California, is apparently spanned by an almost infinite number of varieties of guayule differing in form, size, color, rate of growth, etc., as well as in their hydrocarbon content.

On the biological side, Dr. McCallum's development of young guayule plants from seed was not accomplished as a practical matter until he had discovered and applied chemical and other means of treating the seed to stimulate and control its germinating powers. At the present time, it is possible to effect practically a 100 per cent germination of guayule seed, whereas early experiments in this regard had been most discouraging.

In the biochemical and chemical fields studies have been made on the composition of the shrub, all with the object of intelligently improving the process of extraction and the quality of the resulting rubber. Perhaps the most important scientific as well as practical accomplishment in this connection is the discovery of the fact that the rubber in guayule shrub does not exist in the cells of the rubber plant in the form in which it is recovered, as has been generally believed, but on the contrary is present there largely in the form of a colloidal suspension in the plant juices. Within the individual cells this fine suspension of microscopic globules in a state of rapid Brownian movement can be readily seen with the higher powers of magnification, and the agglomeration and final coagulation of these globules into microscopic particles of rubber by coagulating agencies, such as alcohol, etc., can be followed.

In my paper read before the American Chemical Society in September, 1926,[3] I pointed out the practical significance of these observations. But for the fact that the rubber in the guayule shrub does exist in this dispersed form, the hope of effecting any large improvement in physical or chemical quality would be much less encouraging. However, existing as it does in a more or less disperse condition, even in shrub which has been partially dried, it will be very apparent to every student of colloid chemistry that there is opened up a wide field for profitable investigation. Much has already been accomplished in this connection, but I believe that we are still only on the threshold of important improvements as a result of this observation.

Composition of the Shrub

Turning now to the composition of guayule shrub as we find it both in Mexico and California, obviously there will be a difference in elemental composition, according to the location and variety of shrub investigated, and also according to the climatic conditions at the time the shrub is pulled for investigation. It is impossible, therefore, to speak of the composition of the shrub except in very general terms.

From a practical standpoint, however, the elements of the shrub can be roughly divided into those which are soluble in water (the tannins, water soluble carbohydrates, nitrogen-containing substances and such like), and those which are soluble only after hydrolysis, which include the pectin-like substances constituting the middle lamella of the cell wall and protein or gluco-protein-like substances which are not readily dissolved out by water, and apparently constitute a large part of the plant. There is also the cellulose or fibrous structure of the plant and the bark, both insoluble in water, and not readily hydrolysed, the true resins and resin acids of the plant, insoluble in water, but soluble in acetone, and the rubber itself, which can be extracted more or less quantitatively by means of carbon tetrachloride.

Investigations have shown that the guayule shrub contains on the average about 10 per cent of material readily soluble in water. There is an additional 10 to 15 per cent of materials which become soluble in water only after hydrolysis. They can be decomposed by fermentation into

[1]This article comprises the greater part of a paper read before a meeting of the New York Group, Rubber Division, A. C. S., April 25, 1928.

[2]Dr. McCallum is botanist of the Continental Rubber Company, of N. Y. An extensive paper by him on the subject of "Botany and Cultural Problems of Guayule," was published in the November 10, 1926, issue of *The Rubber Age* Vol. 20, pp. 129-132).

[3]Published in *The Rubber Age*, Nov. 10, 1926 (Vol. 20, pp. 133-135).

water soluble decomposition products, and consist essentially of carbohydrates on the one hand and vegetable protein on the other. In the milling of the shrub these water insoluble plant products become bound up in the rubber to a greater or less extent, and are responsible, as we have discovered, for the high acetone extract of guayule rubber and for several of its more obvious deficiencies. By decomposition of these carbohydrates, by fermentation into water soluble derivatives, such as sugars, organic acids, carbon dioxide and the like, and by putrefactive decomposition of the vegetable protein prior to milling of the shrub, it is entirely possible to reduce the acetone extract of guayule rubber 60 to 70 per cent, and to improve the vulcanizing properties of the rubber 30 to 40 per cent.

By a process of retting of guayule shrub under suitable conditions and prior to milling, somewhat analogous to the retting of flax, it is possible to reduce the acetone extract of the resulting rubber from 25 to 30 per cent to 9 to 10 per cent. The physical properties on vulcanization of the resulting rubber, on the other hand, if the retting operation is properly carried out, can be so modified that the tensile properties of the rubber may be almost doubled. These are rather astounding results, and it would take me too far afield to go into the researches which have led up to these remarkable discoveries.

That the acetone extract of guayule rubber is only in small part of truly resin character, and is not a definite and unalterable component of guayule rubber, but rather an accidental associate of the same which can be removed to a large extent without resort to the expensive and troublesome operation of extracting the rubber by acetone, by the simple and inexpensive expedient of submitting the shrub to a thorough fermentation before milling the same, has been demonstrated beyond any possible shadow of doubt. In addition, by suitable decomposition by putrefaction of the protein in the shrub, it has been found possible to improve tremendously the quality of the resulting rubber from the standpoint of its stability and tensile in vulcanization.

Composition Has Been Changed

These discoveries, which have all been made within the past two years, are now finding definite expression in the production of Ampar[4] rubber. A way has been opened up and means found of completely changing the composition and vulcanizing quality of guayule rubber. That the final word has been said in this direction, I would be the last to predict. I am more inclined to believe that we are only beginning on our development of this product, and that in due course results of still greater importance will be obtained.

It is interesting to note in passing that the treatment to which we now subject the shrub prior to milling is one which, from the early days of the guayule industry, has been regarded as suicidal to quality of rubber. This retting of the shrub causes a more or less complete disintegration of the cell structure of the plant, and results in a product going to the mill very much changed, structurally as well as chemically.

It would take me too far afield to go into the fascinating studies—chemical, bio-chemical and microscopical—which have led up to and followed from this retting of guayule shrub. From the retting liquor, it is hoped in due course to develop products of commercial value, and similarly the other by-products of the plant, the fibre in particular, should find in time some better industrial application than that of a fuel to be burned under boilers.

In regard to the rubber itself, some very interesting studies have been made and are still under way in California to determine the conditions under which the maximum yield and quality are obtained. That there is a seasonal variation in the percentage of extractable caoutchouc from the plant is clearly indicated, but the conditions under which a maximum caoutchouc content is obtained are still a matter of further investigation.

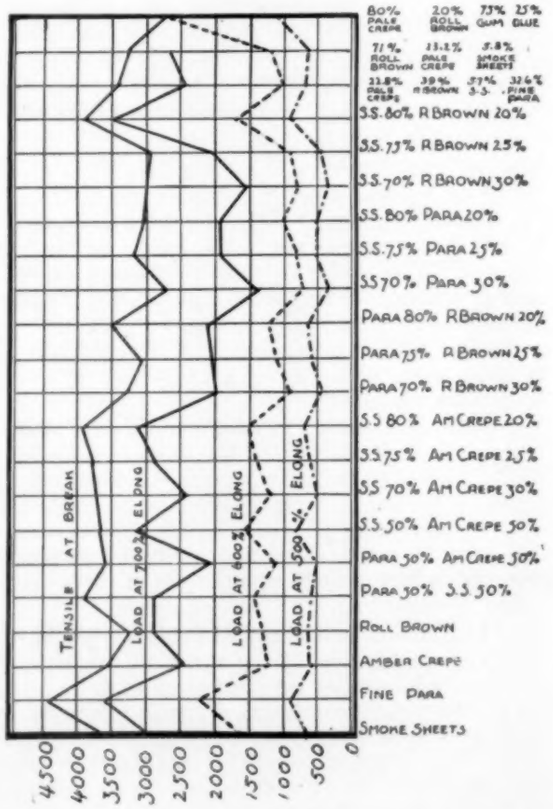
Similarly the quality of the hydrocarbon itself cannot be said to be finally settled until the problems of coagulation and preparation of the rubber from the shrub have been exhaustively investigated and once and for all disposed of. At the present time, the rubber hydrocarbon from guayule, as we have prepared it, appears to more nearly resemble the hydrocarbon from Caucho Ball in its physical properties. Whether this is an inherent characteristic of the rubber from guayule, or merely the result of the treatment to which the green shrub is now subjected after it is uprooted and before milling, time and experimentation alone will tell.

[4]Trade name adopted by the Intercontinental Rubber Company.

Rubber Blend Chart

A CHART showing load and tensile tests made with stocks containing various combinations of standard and off-grade rubbers was recently issued by the testing laboratories of the Roessler & Hasslacher Chemical Company, New York City. This chart, illustrated herewith, has been found useful in the R. & H. laboratories, and was offered to the industry only after it had proved its worth over a long period of time.

A standard formula consisting of 100 parts rubber, five parts zinc oxide, five parts sulphur and one part DPG,



was used in making the tests. The cure was for thirty minutes at 287°F. The chart was devised with the object of showing which combinations of raw rubber work well together, and which combinations do not work satisfactorily. By the use of such a chart, rubber manufacturers can blend their more expensive rubber with the cheaper grades, and still maintain their quality. As, for example, it will be noted that 80 parts smoked sheet with 20 parts roll brown produced a very firm stock, whereas a combination of 70 parts smoked sheet with 30 parts fine Para produced a rubber with unusually low physical properties.

ORGANIC COLORS For Use in Rubber Compounding

An Authoritative Article on the Subject of Organic Rubber Colors, A Science Comparatively Little Known to the Average Compounder

By M. P. PARKER
Chief Chemist, Pigment Division, J. M. Huber, Inc.

THE present day demand for bright colors, not only in rubber clothing and beach apparel but also in everyday household articles, has been met by the general use of brightly colored organic compounds. There are many such compounds covering a very wide range of colors which will not decompose under the moderate conditions of time and temperature in modern practice of vulcanization. Also there are blends without number that can be prepared in the wet stage of the color manufacturing process, so that now it is possible to duplicate nearly any required tint or shade in a manufactured rubber article. The following will describe some of the more common as well as more popular rubber colors.

Reds

Probably there are more organic compounds of a red shade which are suitable for rubber compounding than any other type of color. The best known reds can be divided into three groups, namely deep, medium and light.

1. DEEP REDS (CRIMSONS)

Lithol Toner: The most widely used deep red is the calcium salt of lithol toner which is a strong and brilliant lithol toner color. If properly compounded this pigment will not bleed, migrate or crock off, although under certain compounding conditions these defects must be carefully guarded against. This color is quite permanent and will withstand any reasonble conditions of vulcanization. Lithol toner is quite economical to use and in some cases will substitute for C. P. iron oxide where a more brilliant effect is desired. It is one of the most popular organic colors for rubber clothing, bathing caps, and rubber sundries.

Madder Lakes: These are concentrated colors produced by precipitation of an alizarine dye stuff on a fine aluminum hydrate base. They vary somewhat in shade, being frequently used to produce the maroon effect. Another type known as Rose Madder Lake can be used in very much reduced form to closely simulate the effect of human flesh, and as a matter of fact this type of color is sometimes used in cosmetics. Madder Lakes are very permanent and non-bleeding and are suitable for practically any type of cure. However, by nature of manufacture the madder lakes are not chemically pure salts but must be precipitated on a semi-transparent base and consequently they are not quite as strong as the toners.

2. MEDIUM REDS (SCARLETS)

Lithol Toner: The lithol toner referred to above can also be precipitated as a barium salt which produces a naturally brilliant red of medium shade. This barium salt is generally used in rubber compounding where a medium red is desired, but, in many cases, the compounder will produce the medium red shade by dilution of a deep red with some inert pigment as lithopone or zinc oxide.

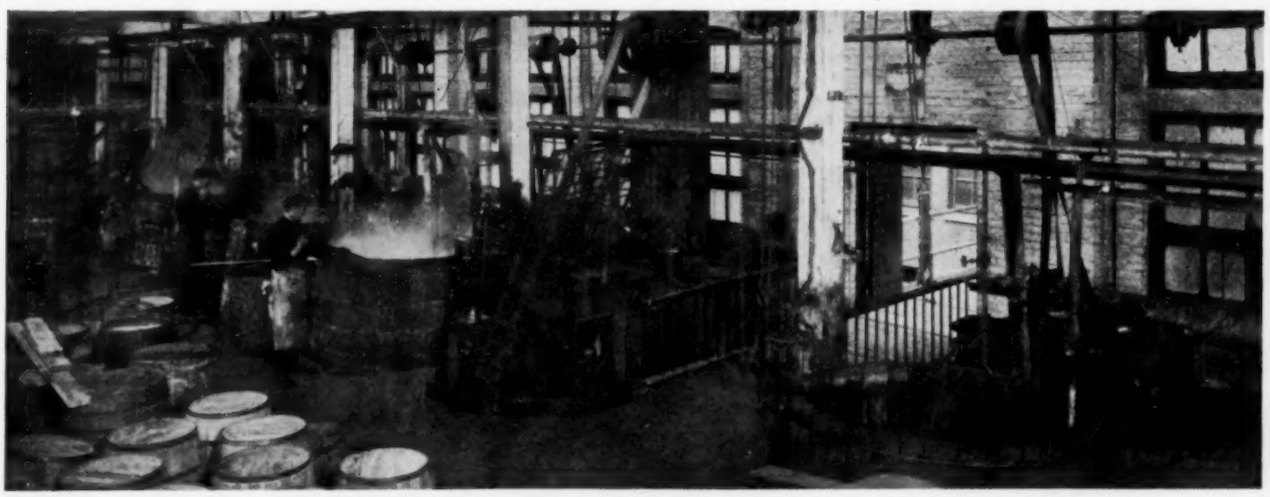
Toluidine Toner: This is a pure toner produced with metanitroparatoluidine and beta napthol. It is one of the most expensive reds, but it has the advantage of being also the most satisfactory for severe curing conditions. It is used for the highest class of work where complete freedom from bleeding, fading, etc., are required. On account of its extreme fineness it can be more completely dispersed than any other type of red.

3. BRIGHT REDS (CHINESE REDS)

Here again the light red effect is frequently produced by reduction of medium or deep reds, although usually at the sacrifice of brilliancy. A third salt of lithol toner, namely the sodium, will produce naturally a very bright, light red bordering almost on deep orange.

Another bright red in common use is made up by the chlorination of paranitraniline and is very popular for producing bright red effects in sundries. This color is slightly more expensive than the sodium lithol toner, but it has more permanency, disperses better, and has less tendency to bleed if properly handled. In some surgical goods it may be blended as a substitute for antimony with more uniform effect, greater brilliancy and frequently lower cost.

The foregoing comprise the better known reds and it should be borne in mind that the colors described are the strongest of their



Tank Room in Dry Color Plant

Dry Color Chemical Control Laboratory

types available. Most color manufacturers can supply any of them in reduced form when the compounder does not care to effect the dilution in his own compound.

Yellows

Hansa Yellow: This is an imported color which is by far the most satisfactory yellow—organic or inorganic—for rubber work. It is permanent, has great covering power, will not bleed, migrate or crock off when cured. For dry heat, press cures and vapor cures it is very satisfactory, but tends to fade in open steam cure.

Chinoline—Yellow Lake: This color has a use in rubber compounding where Hansa Yellow cannot be used on account of its relatively high cost. This pigment is not nearly as permanent as Hansa Yellow but is entirely satisfactory for certain kinds of products as toys and novelties.

Oranges

The best known organic orange colors belong to the general group known as acid orange, usually produced in the form of a lake color and frequently known as a Persian Orange. This type of color is not satisfactory for rubber compounding except under mild curing conditions, and even then its permanency leaves much to be desired. Most compounders prefer to use one of the bright reds either suitably reduced or blended with a permanent yellow such as the Hansa. Color manufacturers can produce these blends in the dry state before shipment of the color, but since the shade is not generally used, such cases are usually handled to meet the individual requirements.

Greens

For general purposes such as paint and printing ink the best known green pigment is known as chrome green, which consists of a precipitated mixture of lead chromate yellow with iron blue (ferro-ferri cyanide). This type of color is not at all satisfactory for rubber work because it will not stand up under ordinary curing conditions, and in particular is destroyed by even a small amount of alkali in any form. Furthermore, the sulfur used in vulcanization usually reacts with the lead chromate producing a dirty effect. There is, however, a concentrated and brilliant organic green toner which is almost universally used for rubber, and this is a combination of malachite green and auramine toner. This color is quite permanent, will not bleed or migrate and will withstand most curing conditions.

Blues

Victoria Blue: Used in proportion of about ½ per cent on the mix it will produce its full color effect, giving a beautiful shade frequently called "Midnight Blue." Lighter shades, down to the so-called "Peacock" can be obtained by reducing the percentage of color or adding more lithopone or zinc oxide, without loss of the brilliant effect. Deeper shades of blue are produced by adding a very small amount of carbon black or black lake.

Browns

Different shades of brown are obtained by blending other colors such as medium red with carbon black. This may be done either by the color manufacturer or compounder. The most satisfactory organic pigment which will give the brown shades without blending is aniline brown lake. This pigment is not affected by curing conditions, is permanent and very soft. However, it must be handled very carefully by the compounder to prevent bleeding and migrating. In many cases the cheap earth colors such as umbers, siennas and ochres are used to produce brown. These colors are cheap in price and will stand up under any curing conditions but, due to the fact that they are mineral colors, they do not produce the brilliance usually required, and furthermore they exert a very adverse ageing influence.

Special Colors: Special colors such as cerise, magenta, burgundy, champagne, wistaria, etc., may be obtained by blending in the color factory various pigments during the process of manufacture. These are all specialities and their properties are dependent upon the pigments used to obtain the desired shade. Many such blends are made when samples of various colored silks are sent in to the color factory for matching.

The Question of Quantity

The question of quantity of dry color necessary to obtain any desired color effect is best determined on a small batch in the laboratory. Generally speaking, in a pure gum stock containing five per cent on the rubber of either zinc oxide or lithopone, one-eighth per cent to one per cent of any organic pigment on the rubber will produce the maximum color effect. This same proportion of the organic color to zinc oxide or lithopone will also hold good for most compounded stocks. More transparent inert fillers as barytes, whiting and clay require a much lower percentage of organic pigment.

Organic Accelerators Preferred

The rubber compounder should always use organic accelerators in compounding for bright colors. This gives him the benefit of short cures at low temperature. The best color effects can be obtained only under these conditions. Any organic accelerator which does not discolor white stocks is satisfactory for colored stocks. Most of the lakes and toners which are used in the rubber industry have little or no effect on the rate of vulcanization. However, some of them slightly retard the cure while others have an accelerating action. This can best be determined in the user's laboratory since so many other factors, also affecting the cure, enter in. In general, none of the red pigments have any effect at all. Under certain conditions Victoria Blue speeds up while Malachite Green retards the cure.

Many of the organic colors described above are types well known in other industries, such as paint, printing ink, carbon paper, etc. However, in practically all cases the color must be specially prepared to meet the extraordinary conditions of rubber compounding. It is usually necessary to wash the precipitated colors much more thoroughly to eliminate the bleeding tendency which would otherwise result. It is always necessary to grind a rubber color much finer than for other industries in order that the color will disperse properly in the rubber mix to give a uniform shade without streaking. With some of the colors it has also been found necessary to alter the chemical formula somewhat in order to prevent reaction with various compounding ingredients commonly used in rubber. Color manufacturers serving the rubber trade have found it necessary to equip themselves with actual compounding laboratory facilities in order to successfully develop the colors and to properly service them. A rubber manufacturer seeking to produce a line of colored rubber goods may save considerable time and effort by submitting his problem with full description of his conditions to the rubber-color manufacturer.

The London Letter Discontinued

Effective with this issue, the London Letter, which has been a regular feature of THE RUBBER AGE for the last two years, will be discontinued due to the early removal from London of its writer who has signed himself, "The Gentleman from Mincing Lane." In view of the changed rubber situation, no attempt will be made to replace the author, and the entire representation of this journal in Great Britain will be turned over to news correspondents who have served it in the past.

Factors Affecting Mill Room Operations

The Five Papers Which Follow Compose a Symposium on Mill Room Equipment and Operations Presented by Leading Engineers Before the Akron Group Meeting, Rubber Division, A. C. S., on April 26.

Chilled Iron Rolls in the Rubber Industry

By N. W. PICKERING

Manager, Roll Dept., Farrel-Birmingham Co., Inc.

PROBABLY no single part of a machine is more vital to the manufacture of rubber products than the chilled iron roll. It is used in most operations from the cracking and washing of the crude rubber to the final accurate calendering where the variation is limited to fractional thousandths.

As you gentlemen are familiar with the history and development of the rubber industry, it is not necessary to go into any details connected therewith, but it might be well to recall to your mind the fact that the vulcanizing of rubber was developed in the year 1844 at Naugatuck, Connecticut, a town located about ten miles from Ansonia, where Farrel Foundry and Machine Company was started in 1848.

The discovery of the vulcanizing process made possible the practical use of rubber, and manufacturing of the product on a small basis very soon started, developing into one of the largest industries of the United States.

In Mr. Farrel's diary of 1854 there is an entry regarding his negotiations with a Mr. Goodyear of Naugatuck, and finally the memorandum of agreement of sale of a three-roll 20x48" calender for $2,400 and a four-roll 20 x 48" calender for $3,400. The calenders were designed and built but the chilled iron rolls had to be imported from England. There were already some mills in this country which had imported chilled iron rolls for rolling copper and brass products and for calendering paper.

First Rolls Made in United States

The initiation of the rubber industry caused Mr. Farrel to decide to start the production of chilled iron rolls and there is a notation in his diary dated 1854 describing the first calender built for Goodyear and expressing the desirability of in future making chilled rolls for the fast developing rubber trade, rolling mills and paper machinery. Since that time for nearly seventy-five years Farrel Foundry and Machine Company and the Birmingham Iron Foundry (now combined) have endeavored to build machinery and chilled iron rolls which would meet the requirements of the rubber industry and, through improvements in these machines, permit the speeding up of production until it has reached the remarkable output now existing in Akron and elsewhere.

Unfortunately, the builder of the machinery cannot be as familiar with all of the difficulties that develop as is the user. It is, therefore, most important for both the user and supplier to have frequent interviews and to discuss thoroughly their respective difficulties. This condition is particularly true in connection with chilled iron rolls as rolls for different purposes are made in different ways, and if the supplier is acquainted with the manufacturer's troubles he can very often make changes which will result in giving better service. On the other hand, the user should understand the difficulties surrounding the manufacture of the rolls and should take precautions to use the material in a manner which will lessen the possibility of breakage and resulting complaints.

Insofar as the rubber trade is concerned, rolls are divided into four principal classifications: First, crackers and washers; second, refiners; third, mill rolls; fourth, calenders. Each of the above classes of rolls vary, both in regard to their chemical analysis, and to their physical qualities. Before speaking of the special peculiarities of these rolls it would be well to set forth the method of molding and casting chilled iron.

Chilled roll iron may contain a carbon running anywhere from 3.00 to 3.75%, depending on the physical characteristics desired in the roll. By the proper adjustment of the silicon, sulphur, phosphorus, and manganese, together with the cooling speed, the carbon may be retained entirely as combined carbon, resulting in white iron, or only partially as combined carbon, resulting in either mottled or gray iron. A combination of the above structural characteristics is present in most chilled iron rolls.

How the Body of the Roll is Formed

The body of the roll is formed by a heavy cast iron chiller, and the necks by sand molds. The difference between the heat conductivity of the iron chill and the sand mold results in the barrel of the roll, where the molten iron comes in contact with the chiller, having a white iron skin, of varying depths, depending on analysis and purpose, the necks being gray. Under the microscope, the white iron portion of the roll would show a structure composed of cementite and pearlite, the gray part of the roll a structure of pearlite and graphite. From this it will be seen that quick cooling gives a hard surface, for instance, cementite, but where the roll cools more slowly the cementite is changed to free graphite which is comparatively soft.

Between the zone which consists of cementite and pearlite, and that consisting of graphite and pearlite, there is an intermediary zone which has both cementite and graphite—in other words, is composed of what is known as mixed iron. A clear chill is of the same hardness and usefulness until the point of mixed iron is reached. At that point the soft iron, or graphite, will show up in the form of minute specks on a polished surface.

One of the great difficulties is to control the various elements in the roll and the temperature of pouring so as to give a chill of the correct depth. Chilled iron is very brittle and the strength of the roll is principally in the backing iron or in the zone consisting of graphite and pearlite. The chilled surface must be sufficiently deep to resist the crushing or abrasive stresses and yet not so deep as to detract from the strength which is expected to be found in the softer iron which lies below it. As will be shown later, this depth of chill varies for different types of rolls.

The roll is cast on end and bottom poured. This is accomplished

by runner gates leading to the bottom part of the roll casting—for instance, into the journal or gear fit. The iron is poured from the ladle into pouring boxes on top of the runner gates which lead the iron into the roll at a tangent, setting up a swirling motion of the iron as it rises through the body of the roll. This swirling motion tends to throw any slag or foreign particles toward the center, leaving the outer surface comparatively free from defects. The pouring is done very rapidly, and continued until the iron overflows at the top end of the casting. The iron molds are carefully coated with a lead wash to prevent the molten iron burning onto the mold itself, and all sand parts, for instance, cores and necks, are washed with graphite to prevent any sand slag on the surfaces.

The Question of Shrinkage

The chilled part of the roll sets up in a very few seconds and the shrinkage in the interior of the roll is fed from a riser at the top of the casting. This question of shrinkage is one of the first difficulties to be overcome. As mentioned above, the skin of the roll sets up almost immediately and this skin is of chilled iron. Chilled iron shrinks about ¼" to the foot, whereas the softer iron shrinks ⅛" to the foot. This difference of two to one causes the outer shell to exert a crushing stress on the interior, putting the chilled shell itself in tension. If the temperature of pouring varies slightly from that desired, or if the chemical composition of the roll is off a very small amount, the roll may split from one end to the other when it is removed from the mold. Another danger in the casting is the tearing of the body from the neck, this also being due to the difference in the coefficient of expansion of the chilled iron from that of the unchilled iron.

Keeping the Core in Exact Position

The majority of rubber rolls are cast with a core. The placing of a core in a gray iron casting is not difficult as chaplets are used to hold the core in exact position to prevent its floating or moving out of place when the casting is poured. These chaplets fuse into the iron and in no way affect its strength. The problem of the chilled iron roll is quite different. Any chaplet that might be placed in the body of the roll would immediaely show up when the roll was machined. The chaplet does not fuse into or become part of chilled iron and it cannot be used where a clean chilled iron surface is required.

It is, therefore, necessary to support the core at the bottom end and to again hold it with chaplets at the very top in the part of the casting which constitutes the riser and which is later cut off. If the roll is short this is not such a serious problem, but on long rolls, such as 84" mill rolls, there is great possibility of the core buckling with the result that the thickness of the wall of the roll is not the same all the way around. Many of you have probably seen mill rolls which have broken and showed the core somewhat out of center, and have probably remarked upon the inefficiency of the foundry which made the casting. Every effort is made to keep these cores central and it is hoped that the next time you have occasion to see a roll broken, with a core slightly off center that you will appreciate the difficulties connected with the casting and be as generous as possible with the roll maker.

Washer and Cracker Rolls

The washer and cracker rolls are usually subjected to heavy pressures and considerable wear. In order to permit recorrugating, it is necessary to chill these rolls more deeply than is the case with other types. Chilled iron has very little strength and if the chill is too deep there is danger of the roll breaking. It is quite difficult to obtain a deep chill and control it with any degree of accuracy. A slight variation in casting conditions may make the chill shoot well into the center, with the result that the roll must be scrapped. Forunately, the cracker roll is seldom subjected to severe strains of expansion and contraction and therefore has to withstand only the stresses of its actual work.

The problem facing the manufacturer is to get a proper depth of chill for the type of cut used, and a strong hard iron which will resist wear and breakage of the teeth. Breakage can be reduced by using the correct cut for the particular duty which the roll is to perform and taking precautions to prevent the cut part of the rolls coming in metallic contact with each other. The question of neck size is important. Records show that much of the breakage is at the neck close to the body. In old crackers the necks are probably too small for the work now being done. In new designs larger fillets are placed between neck and shoulder and the necks increased to give strength in proportion to the body.

Refiner Rolls

The refiner roll probably has the hardest treatment of any type. The rolls are run together with considerable friction and are set up with great pressure. The friction on the surface causes excessive heat and to carry off this heat cold water is run through the core. There is much breakage in this type of roll and records show that about 85% of the breakage occurs in the large size roll, whereas, in the case of 30" refiners, this roll is twice as strong as the smaller roll. This clearly shows that the breakage in refiners is not due to a weakness in design, or in the iron, as the small roll is subjected to just as much pressure as the large one and yet in the majority of cases does not break. Practically all breakage of refiners is in the form of longitudinal splits. If the breakage were due to working stresses in excess of the strength of the material, the fracture would be circumferential, although heat strains also enter into such breakages.

The writer believes that the breakage of these rolls is principally due to expansion and contraction, and the greater the diameter of the roll, the greater the stresses that are set up due to the difference in expansion between the chilled iron on the exterior and the softer iron center.

If a refiner is started, by warming up the interior with steam, and later when the temperature of the surface gets to working heat, cold water is admitted, there is a sudden change in temperature which sets up a strain in the core and is very liable to start a crack. Furthermore, the interior of the roll is in a strained condition due to the fact that the exterior has hardened first and the interior is compressed by the surface. Irrespective as to whether the warming up is external or internal, considerable time should be used in the operation. This feature has been carefully studied in metal rolling mills and the writer recently read a German treatise on rolling mill practice in which it was stated that the warming up of rolls should require eight hours and the process should be accomplished by using water at a temperature of about 175° F. Needless to say, our present production methods would not tolerate such delays.

Breakage From Expansion and Contraction

Breakages from expansion and contraction are not limited to the longitudinal position. Let us assume a roll is twice as hot on the exterior as on the interior. The chilled shell, already under severe tension from its casting condition and with double the coefficient of expansion of the core, expands lengthwise four times as fast as the core. This causes the chill to have a stress tending to pull it apart and tear it away from the softer interior. The hottest part of the roll is probably the middle and this expansion strain combines with the working stress to cause circumferential breakage. This condition is even more applicable to the mill roll than the refiner.

There seems to be no standard practice in regard to the crowning of refiners. We have cases where we have crowned 21 and 24x32" refiners as much as fifteen thousandths total, whereas other customers do not wish more than one-third of that amount. Of course, the greater the crown the more pressure can be applied to the rolls without causing them to open in the middle, but, on the other hand, this great pressure is subjecting the outer layers of the metal to considerable flexing on each revolution. Chilled iron is very brittle and cannot stand the continual flexing without breaking through fatigue.

If the rolls are set up with the great pressure and have not enough crown on them the result is that the rolls bear heavily on the ends and open up in the middle and it is quite possible that small pieces will break off the end of the roll and that this chipping, or spalling, may then develop into a crack.

With a view of reducing the amount of breakage in refiner rolls, we have tried making them of a comparatively thin shell, for instance, three and one-half to four inches. Theoretically, the thinner the shell the less danger there should be from splitting in so far as the effect of expansion and contraction is concerned. This is clearly shown by pouring hot water into a thick glass and a thin test tube. The thick glass is very liable to crack, whereas the thin test tube used in the chemical laboratory can take boiling liquids and practically never break. We have found that the thin shell refiner stands up better than the thick shell unless the roll is subjected to great pressure. If, as we have known cases, the rolls are set together cold with a ten-foot bar on the setting up screw, and then steam is turned on them to bring them up to working temperature, it is quite prob-

able that the thin wall may tend to break down. The larger roll has a flatter arc than the smaller roll and therefore cannot withstand the pressure on the arch of its surface as well as the smaller roll with the result that a longitudinal crack may develop.

For information purposes we have broken up many of these split rolls and the fracture shows that the cracks usually start on the inside surface and work towards the exterior. Just how long it takes such a crack to develop we do not know, but from the appearance of the fracture it is slowly progressive and a refiner roll may hold together for several days or weeks when the crack has nearly reached the chilled surface. Sometimes a spall or flaking of the hard metal will occur at the point where the crack passes through the chill. We know of several cases where spalls have been brought to our attention as an evidence of weakness but when the roll was broken the crack was seen going from the interior to the point where the spall occurred.

Mill Rolls

The mill roll is probably worked nearer to its designed strength than any other type. The strains are not as severe as in the refiner roll due to the fact that there is not the variation in temperature and the rolls are not set up with such pressure. However, they are much longer in proportion to their diameter and the 22x84" mill roll has less factor of safety than any other size. Practically all breakage of mill rolls is circumferential, which clearly indicates that the breakage is due to heavy working stresses added to the condition of hot surface and cool core. Exceptionally tough or cold stock or improper feeding into the mill may be the direct cause of breakage. Mill rolls are made of strong iron and the chill is kept much lighter than in other rolls. As stated above, the chill has very little strength and as mill rolls have relatively thin walls, the depth of chill is kept at approximately five-eighths to three-quarters of an inch.

One of the greatest problems facing the milling operation is the cooling of the rolls. With this necessity in mind there has been a demand for rolls with thinner shells and yet of equal or greater strength than those now in service. Many rolls with thinner walls have been tried, but it is difficult to obtain a roll with a thin wall and yet of sufficient surface hardness. Chilled iron resists abrasion better than any other material but chilled iron has not the strength of steel. Farrel-Birmingham Company has recently developed an alloy roll which will give the same strength as the usual type of chilled roll, with about 25% less wall thickness, and are developing a mixture which gives prospects of permitting even thinner walls with the same strength roll, or conversely will give a stronger roll if walls are not further reduced.

Unfortunately the manufacturer of the roll is not in a position to try out all of the theories in regard to cooling, but a theoretical investigation leads us to believe that the question of wall thickness is not as vital as certain other factors. Professor Joseph W. Richards, who had the chair of metallurgy at Lehigh University, states in his volume on "Metallurgical Calculations" as follows: "The valuable practical conclusion is, that the thermal resistance of the walls of the pipe is insignificant as compared with the whole thermal resistance, and the thickening or thinning of the walls of the pipe, or the substitution of copper for iron because of its greater thermal conductivity, is practically unnecessary for thermal considerations, since such can be expected to make practically no change in the thermal resistance of the whole system."

High Thermal Resistance of Scale

The above quotation refers to the transfer of heat from fuel, to a liquid inside of a pipe, but is entirely comparable to the case of a roll where the hot material is the rubber surrounding the roll and the material to be heated is the water on the inside. Professor Richards says in the same volume that scale two-tenths of an inch thick on the surface of the pipe would have a thermal resistance one hundred eight times that of iron. Or, in other words, scale two-tenths of an inch thick would have the same resistance to conductivity as 21.6 inches of iron. If these figures are correct—and they are quoted from the highest authority on this subject—it would lead one to believe that the difficulty in cooling compound on mill rolls is primarily due to scale or mud which accumulates on the interior of the roll, causing the thermal resistance from roll to water and the thermal resistance of rubber to roll, to be of much more importance than a variation in thickness of roll wall. This condition is thoroughly recognized in marine water tube boilers where there is always danger of salinity in the feed water. If such tubes are not cleaned at the proper intervals there is great danger of their being burned through, due to the fact that the heat of the gases is not conducted through to the water with sufficient rapidity. Hence, the pipes are not kept below the melting point.

The average well water may be high in lime or magnesium, either of which elements will give a heavy scale, and if river water is used there is apt to be mud and slime deposited unless the water is put through a filtration plant. There is absolutely no scale on the interior of the roll after the core is removed. In place of scale there is a hard skin of iron due to a very slight chilling effect when the iron comes in contact with the core, but this iron is an integral part of the roll and its conductivity can be treated as that of hard iron which is given by Professor Richards as the same as for hard steel. The core is covered with a lead or carbon wash and this wash keeps the interior of the roll entirely free from any scale or slag, as carbon fuses at a temperature higher than 3000 F., whereas the roll is poured at a temperature of approximately 1000 degrees below that point.

Methods of Applying Cooling Water

Next important to the condition of scale is the method of applying the cooling water. Many rubber mills complain of the large volume of water used in cooling. The larger the core in the roll the more water it requires to fill it, but it is believed that having the core full of water is the wrong system. The only water that does any good for cooling is the thin film which comes in actual contact with the metal. This film should be constantly changing and the best way to accomplish such results is to use a spray pipe which directs a strong spray of water upwards against the interior of the wall. Unless there is free drainage from the body of the roll the spray pipe will be covered with water and be of absolutely no value in so far as delivering a spray is concerned. If the spray is applied against the interior of the roll with considerable force, it will tend to remove any globules of water that may cling to the somewhat roughened surface of the interior, and this constant changing of such film of water will carry away heat very rapidly. If this spray is applied as described above, the roughness of the surface will be of some advantage, the same as the veins on an air cooled engine against which there is a constant flow of air.

If the data available on thermal resistance and conductivity is correct, it would seem that the best results could be obtained as follows:

First: By using jackstones or some such rough pieces inside of the core which would tend to dislodge or wear away any scale or mud which might tend to accumulate from the circulating water.

Second: By permitting a sufficiently free drainage to carry off all surplus water.

Third: By locating the spray pipe so that it will be above the level of the water which is being drained off, and deliver a flow of water against the roll shell.

Freedom From Scale Important

Based on Professor Richards' theory, no great advantage is obtained from the thin wall roll provided the interior surface is clean, but the increase in diameter of the core gives a greater cooling area. This area of inner wall increases directly as the increase in diameter of the core. As an example, if we compare two 22x84" mill rolls —one with a 5" wall and the other with a 3" wall—the cooling area is as 3 is to 4 or, in other words, there is 33⅓% more cooling area in the case of the thinner shelled wall and it is believed that this factor is of more importance than the resistivity of the iron.

We recently made a line of 60" mills, some of which were furnished with rolls of 3" wall and others of 4" wall. If the question of area of internal wall is taken into consideration, there should be a difference in cooling effect of approximately 15% in favor of the thin walled rolls. We have recently had a report giving the temperatures, and the thin walled rolls had surface temperatures varying from 10% to 14% less than the temperatures of the thicker walls, which is surprisingly close to the calculations made on the basis of area only. This test can be considered a proper comparison as all of the rolls tested were new. It is not believed that a test is of any great value in which new rolls are compared with old ones, as it is highly probable that the old rolls have a coating of scale on the inner wall.

Calculations made from certain tests on an 84" mill showed that

the total thermal resistance between rubber compound and water on a roll with a 4½" wall was divided approximately as follows:

Thermal resistance rubber to roll	41%
Thermal resistance through roll	30%
Thermal resistance roll to water	29%

In this case the interior of the roll had been cleaned and was free from any scale deposit from the water. If this roll wall had been reduced in thickness by 33⅓%, or made 3" thick, the total difference in resistivity from compound to water would have been less than 12%, or would have amounted to only 3 degrees reduction in stock temperature. These calcuations do not take into account the increased area of the larger core which had been discussed in a previous paragraph.

All of the above discussion is based on the present method of cooling—for instance, taking off the heat generated in mixing and compounding rubber by passing the heat through metal and in turn cooling the metal by means of water. Is it not possible to accomplish the cooling of this rubber in a more direct and possibly simpler manner? In certain other industries the surface of rolls becomes excessively hot and is cooled by an air blast blowing directly on the surface. An air blast in the case of mixing rolls would be detrimental unless it could be so applied as to prevent the danger of blowing the pigments or compounding powders away from the rubber. Could not this be done by making a three roll arrangement by means of which the rubber can receive greater cooling by means of air and at the same time an air blast be used on the surface of the rolls without danger of blowing away any of the ingredients?

Calender Rolls

The roll which requires the greatest accuracy is the calender roll. This roll is subjected to pressures not as great but somewhat similar to those encountered in the case of the refiner roll, but at the same time is subjected to alternate heatings and coolings due to the accurate temperature control required on the surface, and furthermore, must have an even line of contact with its neighbor under the conditions of heating and cooling and under the particular pressure for which it is designed. A roll that is cored will be sufficiently strong but if the wall is somewhat thicker on one side than the other or if there is a very slight porosity in the neighborhood of the core, the roll will not expand evenly when heated. It may be ground perfectly round when cold but when heated it will become eccentric. For this reason all calender rolls are bored. They are usually cast with a core and then bored out to a diameter about 3" larger than the diameter of the core. This gives a true hole through the roll and removes any porous metal which might be in the center of the casting. It is probable that expansion and contraction is largely responsible for the breakage of calender rolls and it has been found that they are subjected to the same stresses in this respect as are refiners.

When a calender is started after a shutdown, care should be taken that it is turning over before steam is turned on the rolls as otherwise it is very probable that a break or split will take place along the line somewhat below the level of the drain. After the roll is stopped, the steam which has been in it condenses and the lower part of the roll becomes filled with water. Water is a perfect insulator and when steam is turned on, and the roll remains at rest, only the top part of the roll expands and breaking stresses are set up at the water line. It is sometimes difficult to establish this maltreatment of the roll as a cause of breakage due to the fact that the crack does not always come directly through the shell at the time the trouble starts.

Controlling the Surface Temperature

Great care should be taken in connection with controlling the surface temperature. A 24x66" calender has a wall thickness of from 5 to 6" and it takes a reasonable time for the heat to pass through it. It may happen that steam has been on the rolls and they are suddenly found to be too hot on the surface. The steam is cut off and as the cooling does not take place quickly cold water is admitted to the interior. This puts a sudden strain on the internal surface changing it from the high temperature due to steam to the low temperature due to cold water, and it is not strange that the crack starts. If precautions could be taken to prevent admitting a large amount of cold water in the body of the roll it is quite probable that its life would be materially increased.

The greatest number of breakages on calender rolls in proportion to the numbers in use takes place on the 32" diameter. These rolls are fully as strong as the 24x66" type in so far as engineering calculations are concerned. The iron used in them is of the best and the fact that they break more often than other sizes must be due to other causes than weakness of material. We have previously mentioned in this paper that it is the larger refiner roll that breaks in place of the small one and we believe that the cause of breakage of the 32" calender is due to the fact that its larger diameter means more expansion and contraction under the variations in temperature. We might mention here that this is no argument against the large size mill roll as the mill roll is continually cooled and not subjected to constant alterations of heat and cold. As a proof of the fact that the working stress on these large size calenders is not the cause of the break, I would cite a recent instance in which a 32x92" roll was cracked for two-thirds of its circumference but nevertheless operated without further breakage. It was finally removed from the calender and broken by dropping one end. If the roll were to break from working stresses it would probably have broken in two parts rather than cracking and remaining in operation with only one-third of its holding surface left.

Machining of Chilled Iron

The machining of chilled iron requires special machine tools. The iron is of a scleroscope hardness of approximately 70 and can only be cut very slowly. The usual method is to use a broad faced scraper tool which takes off the surface in the form of small shavings which look like needles. The cutting is accomplished at a speed of about 16" per minute and the cut is only a few thousandths deep. Many types of tool steel have been tried but the machining of chilled iron is not a question of the tool standing up under the frictional heat of cutting, but it is a case of its maintaining its hardness against a very hard surface. Many of the best cutting high speed steels break off their edges when used against chilled iron.

The most important factor in the calender roll is the accuracy of grinding. Each type of work to which a calender is subjected has its own peculiar requirements and a calender that is ground for sheeting out one type of rubber cannot be expected to do good work on friction or skim coating. It is possible to so grind a calender as to give compromise results but perfection is not usually obtained on various types of work with the same machine. Rolls are ground so as to permit a perfect line of contact between the top and middle and the middle and bottom when running the particular material for which the calender is designed. For average work the middle roll is straight, the top roll crowned, and the bottom roll concaved. The crowning of the top roll compensates for the bending of that roll when a bank of rubber is run between it and the middle roll, the result being an even calendering of the material which passes between these two rolls. The pressure at that point has not only nearly straightened out the top roll but has bent the middle roll downward a few thousandths. The operation between the middle and bottom roll is not quite sufficient to straighten out the middle roll from the pressure on its under side, therefore, a slight concavity on the bottom roll is necessary in order to give an even gauge between the bottom and next to bottom rolls.

How Calender Rolls Are Ground

These calender rolls are ground running on their own journals (not on centers) and therefore, there is no chance of the face being out of round with the necks. An accurate caliper which is self-recording measures the curvature of these rolls and this curvature —either crowning or concaving—is applied by means of a device on a grinder which we have built for that special purpose. The maximum difference in diameter between the middle and the end of the roll is not the only important factor. In the case of calender rolls the grinding is done with the roll cold and then while it is still turning it is heated with steam and a dial indicator run on the surface to make sure that it expands evenly. If there is the least unevenness of expansion the roll may be rebored until the results are correct.

Chilled iron rolls are used in many other fields besides the rubber industry, principally in steel rolling, rolling of non-ferrous metals, paper calenders, textile and special finishing calenders, rolling grains and oils, making corn flakes and other cereals, grinding paint, ink and chocolate, making soap flakes, and in fact for rolling all plastic material. We have had occasion to supply all of these fields and each one of them has its own problems some of which are more difficult to solve than those connected with your particular line.

We are sometimes called upon to make chilled iron rolls of un-

usual proportions. For instance, about four years ago we made for the linoleum industry a roll 72" in diameter 90" face. This presented a difficult engineering problem and required many special riggings. However, we made it to the satisfaction of our customer and were very much pleased to see the amazement of two Austrian manufacturers when they learned that such a roll had been made as they had been trying all over Europe, Krupp included, to get a roll of that size and were told that it was impossible.

We are now engaged in making a paper calender stack with rolls 298" face. These rolls will be about 35 ft. long. The largest one is 36" in diameter and will take about 110,000 pounds of metal to pour it. Not only is it a difficult problem from the viewpoint of handling the iron, molding and transporting, but when it is realized that this roll must be crowned to within a quarter of a thousandth of an inch of exact curvature, it will be appreciated that we must combine quality with quantity.

Probably the most accurate grinding on any rolls is required on these paper calenders. A stack consists of about eight to ten rolls running one on top of the other. All of the weight of the stack rests on the journals of the bottom roll and the bottom roll is so crowned as to compensate for the bending effect of the rolls above it. The 36x298" roll will have to be crowned probably about ninety thousandths of an inch. When the rolls are ground they are placed one on top of the other and a light passed back of the line of contact. If a blue flicker can be seen between the rolls they must be reground and a blue flicker is less than a quarter of a thousandth of an inch.

Open Mill Mixing vs. Internal Mixers

By P. P. CRISP

The Miller Rubber Co., Akron, O.

AT the present time about 80 per cent of all the mixing at the Miller Rubber Company is done in internal mixers. All tires, tubes, heels and in fact all stocks with the exception of highly colored bath caps, water bottles and the like are mixed on these machines.

The transition from mill to internal mixer has been gradual as there were many difficulties to iron out, both in the original mixer itself as well as in the operation.

Our first experience with the internal mixer dates back to 1916 when we installed a small machine. The troubles encountered with this machine were largely due to the inability of getting rid of the heat generated during the mixing operation. In 1919 we installed the first mixer with which we mixed tire tread socks with some degree of success. Our biggest difficulty at this time was not the dispersing of the powders or pigments in order to meet gravity and tensile specifications, but was rather due to the fact that the mixed stock refused to run through the calendars and tube machines on account of being too stiff.

The next problem was then to change compounds where necessary so that the finished product would meet all specifications as regards tensile, etc., and still be soft enough to run through the ensuing operations. Until 1923 we used the type of internal mixer which handled about a 275 lb. batch. At this time we installed a mixer which would take the 775 lb. batch of a gravity of 1.2. We found that this machine was a vast improvement over our past mixing machine and showed us many advantages over the mills as regards mixing cost, ease of quality control, low compound room cost, floor space saving and the isolation of gas black dirt.

Refrigerated Water and Internal Mixers

In the past four years we have changed a large percentage of our mixing from mills to internal mixers. A condition in our factory which helped us to a large extent in the development and use of this type of machine was the fact that we have refrigerated water which runs at an average of about 43 deg. F. the year around. There are conditions in each factory which are peculiar to that specific plant. The following comparisons between mills and internal mixers might not hold true in all rubber factories and are only given to show why we, with our existing stocks and existing factory conditions, do in a large measure mix by the internal method.

From a production cost standpoint, the internal mixer has made it possible to reduce our mill-room costs very materially. The biggest reduction in all cases was in direct labor and electric power. For comparative purposes, I will deal in these two items only, taking first an average tread stock, then a friction or coat stock and finally a heel stock. The cost per 100 lbs. and machine hour production was as follows:

On an 84 inch mill the direct labor for tread stock was 20 cents per 100 lbs. as against 12 cents on the internal mixers. The power was 29 cents as against 18 cents on the mixers, and the machine hour production was 400 lbs. as against 3,700 lbs. with the mixers.

The coat stock on the mill showed a direct labor cost of 25 cents as against 14 cents, and for power, 36 cents as against 23 cents, and machine hour production was 322 lbs. against 3,210 lbs.

The heel stock shows a direct labor of 17 cents as against 9 cents, a power charge of 24 cents as against 14 cents and a machine hour production of 450 lbs. as against 4,560 lbs.

In all cases these comparisons contain the cost of running the batch out mills and when speaking of the mixer, I am, of course, including the mills which are considered as a mixing unit. These comparisons indicate an average reduction for power and direct labor of 21 cents per 100 lbs. in favor of the internal mixer. There is also a very material reduction in cost possible in the compound room. As you can readily see, it would cost only slightly more to weigh out the ingredients for an 800 lb. batch than it would to compound a 200 lb. batch.

Better and Cheaper Supervision

The next advantage to consider is the case of supervising quality. One supervisor will supervise two mixing units capable of turning out 60,000 lbs. per shift. We test each mill batch as it comes from the batch-out mill of the mixer for gravity, cure, stretch and plasticity. If a batch is found to be defective, the supervisor can check the temperature chart on the mixer and this will tell whether the mixing crew lived up to specifications as regards time and temperature.

It is also possible by the installation of internal mixers to save much valuable floor space in the mill room. This is especially desirable where it is possible to hook up mixing equipment direct to a large producing calender or tube machine installation.

Too much stress cannot be put on the point of quality mixing of high grade present day stocks. This is especially true of the present day balloon tire tread stock. With these particular stocks it has been necessary to work out specifications very carefully to get good dispersion. The addition of the pigments in the proper sequence, the use of the mixer weight only during a short period in the mix and the use of an additional batch-out mill are the most important points here.

We use three batch-out mills for this class of stock and after the batch is divided in three parts it is given a seven-minute mill-mixing before the batch-off operation is begun. This is as long a mixing time as the average 84 inch mill batch is given after the pigments have been added. You can readily see that this should handle our dispersion problem. Our laboratory makes special tests from time to time for dispersion and since using the above-mentioned precautions, we have had no trouble whatever.

On cheaper grade stocks such as heels, automotive accessories, cab tires, etc., the operation of the mixer is much easier than the use of mills. On very cheap batches much trouble is encountered keeping them on the mills as well as in the addition of large quantities of oil

which these stocks usually contain. The internal mixer will turn out these stocks in a surprisingly short time with practically no production trouble.

The greatest trouble encountered in the use of these mixers has been the elimination of heat generated and the rapid war in the mixing chamber. The latest development in these machines has been the use of sprays in the jackets for cooling which takes away the heat faster, and in the use of inside jacket liners which are more resistful to premature wear and when they are worn out, can be replaced over the week-end at a comparatively small cost.

Power Variables in Milling and Mixing Rubber

By P. S. SHOAFF

Goodyear Tire & Rubber Co., Akron, Ohio

OF THE expenses involved in the milling and mixing of rubber, the costs of materials and of labor are constantly subjected to the closest analysis. Economic drives are concentrated mainly upon them. Power, being a less tangible thing, often eludes the attention that is warranted by the profitable study of factors which may introduce savings. Frequently its cost equals or exceeds that for labor in a mill-room operation. When in a large factory there may be previously plasticized daily a half million pounds of crude rubber, when a half million pounds of master-batches are prepared, and when every day one and a half million pounds of compounded rubber stocks are mixed, power bulks enormously. Milling and mixing equipment to do that demands a power input of approximately 21,500 horsepower, or about 386,000 kilowatt hours. At one cent per K. W. H., as an example, this represents a daily cost of $3,860. With an average of 250 working days a year, the total reaches nearly a million dollars. The smaller manufacturer makes a proportionate outlay for power in these preparatory processes.

So it would seem worth while to study power applications and those variables which may be turned to account in the search for greatest efficiency. Some points which may be mentioned are in part a review or confirmation of the findings of others which have appeared in published articles[1] [2], other facts are from observations of very recent practice.

Factors Governing Power Input

Neglecting machine losses, the principal factors governing the power input to the ordinary two-roll rubber mill are, first, the speed of the front roll; second, the friction ratio, *i. e.*, the ratio of the surface speeds of the two rolls; third, the gauge of the rubber or the stock, and, fourth, the temperature of the rolls and of the material being worked.

The speed of the front roll of a mill is largely limited by safety considerations for workmen. We have found a surface speed of about 93 feet per minute preferable for the front roll of an 84-inch mill. Higher speeds result in increased power requirements, with accompanying difficulties in temperature and plasticity control, and with no saving in the time for adding compounds.

Power input increases with an increase in friction ratio, and peak loads are higher. Since the plasticizing of rubber is fastest at ratios above one, but under 1.30, and since compounds are incorporated in a mix most efficiently at even roll speeds or at low friction ratios, it would, therefore, be theoretically advantageous to employ separate mills for these particular purposes. But the inflexibility of such an arrangement suggests a compromise. We have chosen a ratio of 1 to 1.23 for 84-inch mills used both for plasticizing rubber and for mixing stocks, and a ratio of 1 to 1.10 for 60-inch mills employed for mixing only. If a heavily compounded stock is mixed on the fast roll of a mill, the rate at which the compound is incorporated is usually faster, with a slight decrease in power consumption.

We know that power input increases with the gauge of the stock. Up to one inch the average increase in power is a little under 20% for each quarter-inch. It may be of interest to mention that we have discarded the practice of breaking down or plasticizing rubber on roll mills for a specified time in favor of a gauging method. Due to the variations in crude rubber and in mill temperatures, breaking down for a set time resulted in wide differences in plasticity. It is found that, if time is disregarded and temperature ranges are reasonable, plasticity can be more accurately controlled by milling until a sample of the rubber cut from the roll gauges a certain thickness. The method effects power as well as labor savings, since reprocessing is minimized.

We have repeatedly noted that power loads are less when rubber is worked on hot mills or in internal mixers at high temperatures than at low temperatures. But the rate of permanently softening is necessarily slower, so that the total power consumption is not reduced, but is increased.[3] However, power may be saved by practices which evade the losses incidental to getting cold rubber or stocks properly working on a mill or in an internal mixer.

Charts Show Power Consumption

From actual power charts we have plotted curves in a form that more clearly illustrates some of the effects when we break down rubber or when mixing stock. Figure 1 shows some of the effects noted in the process of breaking down rubber on a standard 84″ roll mill. The final plasticity figure (Williams, K_3) was .339, with a recovery of .051, the operation requiring a total power consumption of 32.94 K. W. H., or 0.1098 K. W. H. per pound. The batch was cooled to room temperature, and was worked on the mill again to the point where it ran smooth (Fig. 2). This resulted in a further softening to a plasticity of .300, with a recovery of .032. Just before slabbing off the batch in the first operation, the plasticity of the rubber was .363 and the recovery .063; at that point a total of 26.86 K. W. H., or .0895 K. W. H. per pound. had been used (Fig. 1). Warming up the cooled batch as described (Fig. 2) required an additional 20.82 K. W. H. total, or .0694 K. W. H. per pound. These comparisons indicate a considerable loss in power during the period of getting the rubber actually working and plasticizing on the mill.

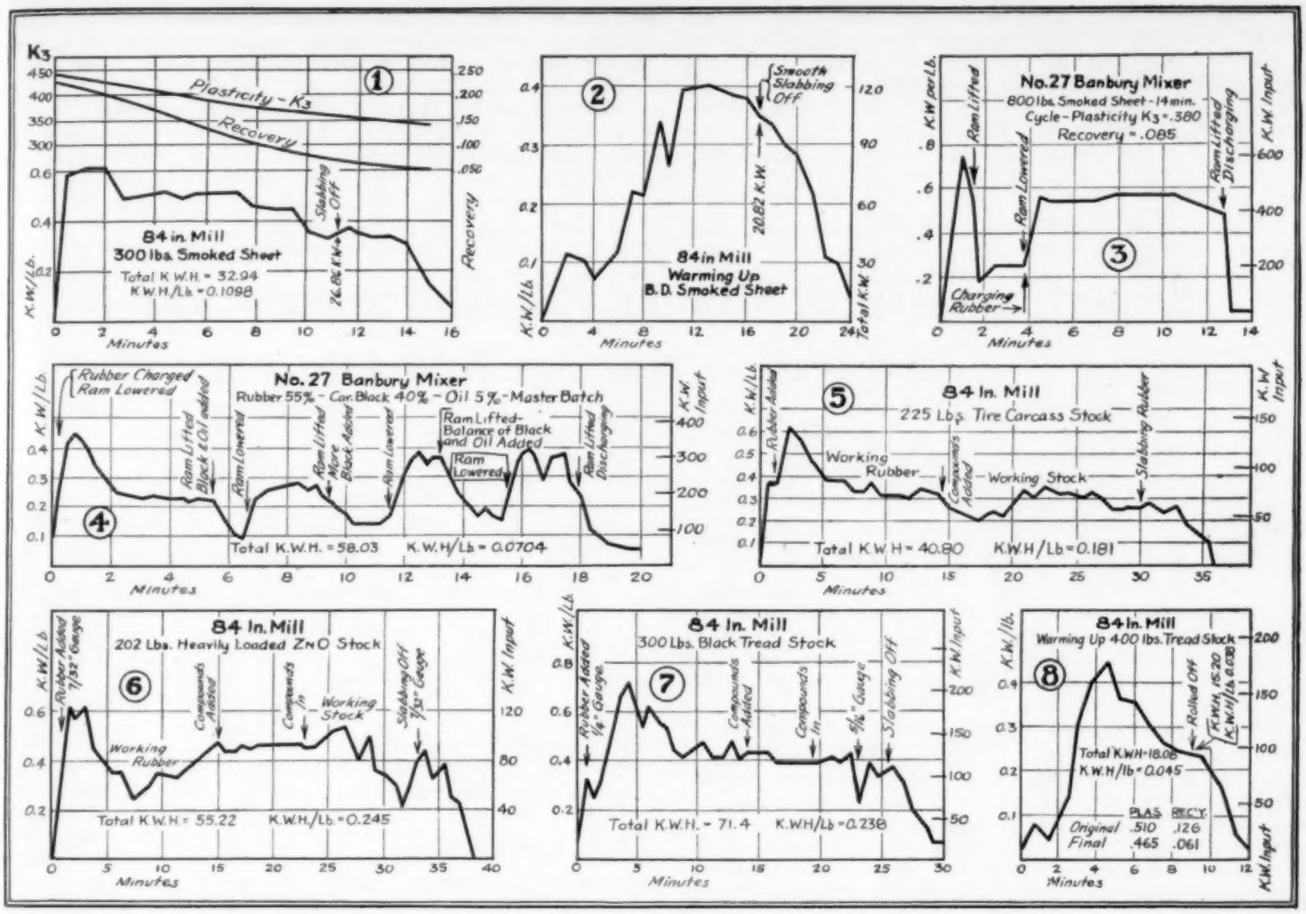
Figure 3 was plotted from a characteristic chart of the power input in breaking down crude rubber in a No. 27 Banbury mixer. It will be noted that several minutes are lost while charging the rubber into the machine. A longer throat might improve the condition, but a change in this construction detail is not needed for mixing operations.

Some average power consumption figures for mixing master batches in a No. 27 Banbury are as follows:

Master Batch Approximate Components	*Sp. Gr.*	*Pounds*	*Time Mins. Total*	*K.W.H. Per Lb.*	*Plasticity.*	*Rec'v'y*
Rubber 55%, carbon black 40%, softener 5%	1.15	835	20	0.0704	.734	.082
Rubber 33%, reclaim 34%, carbon black 30%, softener 3%	1.20	862	20	.078	.800	.22
Rubber 67%, softener 33%	0.91	1,050	45	.101	.235	.04
Rubber 90%, softener 10%	0.95	750	20	.097	.310	.02

Figure 4 refers to the operation of mixing in a No. 27 Banbury mixer a master batch of approximately 55% crude rubber, 40% carbon black and 5% softener. The variations in power input with the different operations are distinctly evident. The advan-

[1] H. C. Young, *Ind. Rub. Jour.*, Vol. 65, No. 10, pp. 405-410 (1923).
[2] R. B. Stringfield, *Chem. and Met. Engr.*, Vol. 32, No. 2, pp. 51-54 (1925).
[3] W. W. Vogt, *Rept. of Phys. Test. Com.*, Rub. Div., A. C. S., April, 1924.



Figures 1 to 8 Showing Power Consumption in Various Milling Operations

tages of preparing master batches on a large scale, followed by blendings and by the addition of sulphur, opens an especially extensive field for the internal mixer. It is by far the most efficient machine for mixing master batches, and introduces large savings in power, as well as in other costs. The smaller factory can employ the internal mixers with less capacities in such processes, although necessarily with somewhat lower relative profits.

Figure 5 shows the power effects in mixing a high-grade tire carcass stock. Figure 6 refers to a stock heavily loaded with zinc oxide. A representative curve for a high carbon black tread stock is shown in Figure 7, while the power used in warming up that stock for calendering or tubing is indicated in Figure 8.

Apron Mill Uses Less Power

Aside from other considerations, an improvement over the plain roll mill is the so-called apron mill, equipped with a conveying belt which continuously returns materials to the "nip" of the rolls. Compared with regular 84" mills for breaking down smoked sheet to the same degree, the 84" apron mill gives not only as much as 15% greater production, but there is about 4% less power consumption, with a 10% increase in loads. The lower power consumption may be explainable by the fact that the apron keeps the sheet of rubber closer to the mill and constantly feeds a rolling bank of material to the nip of the rolls, while during the first stage of milling the plain mill squeezes rather than works the loose sheet returning to the nip. An additional saving is realized when mixing stocks, due to a more rapid incorporation of compounds.

Herewith are shown some power comparisons for mills and internal mixers. All data on mills refer to 84" machines, with the front, or 26" diameter, rolls running at 93 feet per minute, and with the face speed of the back, or 22 3/16" diameter, rolls at 104.6 feet per minute. This is a ratio of 1 to 1.23. The internal mixer was a No. 27 Banbury, with rotors running 14.5 R. P. M. and 12.5 R. P. M., respectively.

We continue to conjecture about the amount of money we spend for power that is greedily gobbled up by that wanton waster, mechanical friction. C. H. Young of the Dunlop Rubber Company of England has made some observations on the power lost as friction in the four bearings of a mill and in the driving gearing. He noted that a mill running idle with rolls set apart required under 5% of the power input of that at full load. But he calculated that under load as much as 40% of the power input is lost as friction in bearings and gearing. That statement has been challenged, and there are estimates that these losses may be nearer 10%. It must not be forgotten that the housings and other parts of mills are excellent radiators of heat, and that the bearings are indirectly cooled to some extent by the water in the rolls. We have evidence which indicates that friction losses in milling machinery are over 20% of the total power input. Mr. Young proposed roller bearings as a means of reducing these losses possibly

POWER COMPARISONS FOR MILLS AND INTERNAL MIXERS

	Batch Lbs.	Total Time Mins.	Avg. Load H.P.	Peak Load H.P.	K.W.H. Per Lb.	Plas. Average	Rec'y Average
SMOKED SHEET:							
84" Mill	400	20	125	175	0.102	.370-.410	.080-.120
84" Apron Mill..	300	12-14	135	175	0.0983	.370-.410	.080-.120
No. 27 Banbury (with sheeter)	800	14	400	600	0.090	.370-.410	.080-.120
TIRE CARCASS STOCKS:							
Sp. Gr. 0.97. (Using B.D. Rubber)							
84" Mill	150	30	90	150	0.176	.315	.014
84" Apron Mill..	150	25	95	150	.164	.315	.014
No. 27 Banbury..	750	10	350	550	.068	.315	.014
(Sulfur Mills)....	.....	....	.....	.....	.048	.....	.....
HIGH C BLACK TREAD:							
Sp. Gr. 1.12 (Using Rubber K_3=.390, Recovery=.100)							
84" Mill	300	30	87	137	0.238	.480	.065
84" Apron Mill..	300	25	90	137	.220	.480	.065
No. 27 Banbury..	825	13	350	500	.074	.480	.065
(Sulfur Mills) ..	.....	....	.....	.....	.058	.....	.....

90%. Immediately there arise the objections that roller bearings might not withstand the shocks to which they would be subjected, and that their cost would be very high in any event. The more efficient roller bearing is proving practicable and profitable in the place of plain bearings for railroad car wheel journals, where strains and shocks are severe. Experiments are under way now with mills. It is not too much to expect that the mechanical engineer will soon make available a satisfactory roller bearing for mill-room machinery that will effect appreciable savings in the power costs for milling and mixing rubber.

Acknowledgment: The writer wishes to acknowledge the assistance of R. W. Moorhouse of the Goodyear organization in obtaining the data given in this paper.

Experiences With Mixing Mill Roll Speeds And Speed Ratios, and Batch Sizes

By ERLE C. ZIMMERMAN

Firestone Tire & Rubber Co., Akron, O.

THE remarks which I am about to make concerning mixing mills apply especially to 84" mills ,with 26" front rolls and 22" rear rolls. Other sizes of rolls have been experimented with, and the results have been about the same as with the 26" and 22". The system of cooling used was that described by H. K. Jennings at the meeting of this group on February 15,* which consists of a spray pipe and open roll and a means for cleaning the inner surface of the roll. The mill was supplied with 10 gallons of 54°F. water per minute, with 5.5 gallons to the front roll and 4.5 gallons to the rear roll.

The speed and ratio of mixing mills can be most clearly described in terms of roll surface speed and roll surface speed ratio. A great variety of surface speeds and surface speed ratios are in use at the present time. Front roll surface speeds as low as 75 feet per minute and as high as 135 feet per minute can be found, and ratios run anywhere from even speed up to front roll to rear roll ratio of 1:2.

The effect of mill speeds and ratios on the mixing of stocks can be best determined by making a study of the temperature of the stock on the mill, the plasticity of the stock and the degree of uniformity of the mixing. Such information may be obtained on one mill equipped to give different speeds and ratios, or on several different mills of the same type. Whatever stock is to be experimented with should be mixed on the mill or mills in question for a few hours, after which several batches should be mixed, on which the average results are to be based. The same mill operators should be used, and the raw material should, of course, be standardized.

Six Batch Test on Two Mills

The results which I am about to describe (shown in Table 1) are the average results of six batches mixed on two mills, each of three different speeds and ratios. The stock was a high quality cord tire tread, and was mixed at the rate of 275 pounds in 33 minutes. At the end of the mixing period test samples were cut from both ends and the center of the mill simultaneously. The roll temperatures were measured by a Cambridge surface pyrometer.

* Mr. Jennings' complete paper was published in THE RUBBER AGE, February 25, 1928 (vol. 22, pp. 532-3).

TABLE I—EFFECT OF SURFACE SPEEDS AND RATIOS

Surface Speed of Front Roll Ft./Min.	Ratio of Front to Rear Roll	Water Temperature °F. Supply	Front Roll Exhaust	Rear Roll Exhaust	Roll Temperature °F. Front	Rear	Stock Temp. °F.	Plasticity	Index of Variation In Gravity
90	1:1.07	54	88	88	131	130	195	3.65	.060
98	1:1.07	54	89	89	133	132	205	3.62	.044
113	1:1.07	54	91	87	137	134	216	3.70	.031
76	1:1.27	54	85	86	116	124	188	3.61	.083
83	1:1.27	54	86	86	120	128	194	3.67	.063
96	1:1.27	54	88	89	126	133	207	3.70	.042
76	1:1.07	54	82	83	116	119	176	3.65	.091
76	1:1.27	54	85	86	116	124	188	3.61	.083
76	1:1.64	54	86	90	120	135	199	3.75	.096

TABLE II—THE EFFECT OF MILL SPEED ON STOCK TEMPERATURE

Roll Surface Speeds Ft./Min.	Surface Speed Ratios	Average Stock Temperature °F.
90:97	1:1.07	200
113:121	1:1.07	213
124:134	1:1.07	221
131:142	1:1.07	234

The stock temperatures were measured by means of a potentiometer indicator and a thermocouple, the junction of which was folded in the stock while it was being cut from the mill. Plasticity determinations were made on the three test samples by the Williams method, the "Y" value for 5 minutes at 85°C being recorded. The index of variation in specific gravity was obtained for each batch mixed by dividing the difference between the correct specific gravity of the stock, minus the specific gravity of rubber, into the maximum variation found in the three samples.

Comparisons to Show Effect of Speed

Three mills with a ratio of front to rear roll surface speed of 1:1.07 and front roll surface speeds of 90, 98 and 113 feet per minute were compared to show the effect of speed. Similarly, three mills with a ratio of 1:1.27 and front roll surface speeds of 76, 83 and 96 feet per minute were compared for additional data on speed. The effect of ratio was studied on a third set of three mills which had a front roll surface speed of 76 feet per minute and ratios of 1:1.07, 1:1.27 and 1:1.64. The following results were obtained:

(1) The exhaust cooling water temperature varied from 85-91°F, and showed practically the same temperature rise in all cases, being slightly higher for the faster mills.

(2) The roll temperatures varied from 130-137°F for 1:1.07 ratio mills, and were equal for both rolls. For the higher ratio mills the temperatures varied from 116-135°F, and the rear rolls ran higher than the front rolls.

(3) The stock temperatures ran 195°F, 205°F and 216°F for the 1:1.07 ratio mills, and 188°F, 194°F and 207°F for the 1:1.27 ratio mills. For both ratios the temperature of the stock increased with increased mill speed. In the case of the mills with 1:1.07, 1:1.27 and 1:1.64 ratios, the stock temperatures were 176°F, 183°F and 199°F, respectively, increasing with increased ratio.

(4) The plasticities of the stock were practically equal for mills of all speeds and ratios tested. This indicates that there is a tendency for the plasticity of the stock to be equalized, due to the relationship between mill speed and stock temperature.

(5) In regard to the uniformity of the stock, based on specific gravity, the fastest mills gave much better uniformity than the slowest mills. Low ratio mills gave just as good uniformity as the high ratio mills.

Similar experiments have been made on a single mill equipped with a variable speed motor. The data listed in Table 2 were obtained on such a mill in mixing a stock containing a high percentage of zinc oxide. Front roll speeds of 90, 113, 124 and 131 feet per minute, and a ratio of 1:1.07 gave stock temperatures of 200°F, 213°F, 221°F and 234°F.

It has been pointed out that front roll speed has a pronounced

effect on the uniformity of the stock mixed. A saving in mixing time can therefore be made by increasing the speed of the mill. It has been found that tread stock which is mixed in 34 minutes on a mill with 90 feet front roll speed and 1:1.07 ratio can be mixed equally as well in 30 minutes on a mill with 113 feet front roll speed and the same ratio. The speed of the mill cannot be increased to such an extent, however, that excessive stock temperatures result, or the stock will cure up on the mill. It is not to be taken from this statement that slow mills are necessary for fast curing stocks. Fairly fast mills can be used for such stocks if the batch size is not too large. The most important fact in connection with mixing mill speeds and ratios is that a high front roll surface speed will give the most thorough mixing at the fastest rate, and that a low surface speed ratio will give a lower stock temperature than a high ratio.

The effects of batch size and mixing time are clearly shown in Table 3. Two hundred pound batches of a cord tire tread stock were mixed for 33 and 66 minutes, and compared with 300-pound batches mixed in the same lengths of time. Outside of the anticipated differences in the plasticities of the stock, no other appreciable differences could be detected. Stress at 400% elongation and tensile were determined on composite samples, representing the different mixes and the results over a range of five cures were averaged together. The stress at 400% elongation varied from 1,635 to 1,730 pounds per square inch, and the tensile varied from 3,820 to 3,910 pounds per square inch, which is no greater variation than is usually found in consecutive batches mixed according to the same specification. Similar results have been obtained in the case of various other stocks; however, there are exceptions.

TABLE III—THE EFFECT OF BATCH SIZE AND MIXING TIME ON THE PHYSICAL PROPERTIES OF THE STOCK

Batch Size in Pounds	*Mixing Time in Minutes*	*Plasticity*	*Stress at 400% Elongation Lbs./Sq. In.*	*Tensile at Break Lbs./Sq. In.*
200	33	4.12	1675	3890
200	66	3.95	1635	3910
300	33	4.55	1700	3820
300	66	4.25	1730	3820

In reference to the large batch versus the small batch, there is, of course, plenty to be said both pro and con. If you are considering pounds of stock mixed per minute to a given degree of uniformity, the large batch is the more desirable. If you are considering uniform plasticity, you will probably want a smaller batch. If the stock is delivered direct from the mixing mill to the tube machine or calender, you will probably want a smaller batch than if your stock is stored and later warmed up. If the stock is fast curing, you will want a smaller batch. If the pigment is added in the form of a rubber master batch, you will probably find that you can mix almost the same number of pounds per minute, whether the batch is large or small. The batch size of any particular stock, therefore, depends not only on the stock itself, but on the subsequent processing of the stock.

The Breaking of Mill Rolls

By J. E. NOONAN

Production Supt., Mills and Calenders, B. F. Goodrich Co.

YOUR chairman has asked me to tell you how mill rolls are broken and what we are doing to keep the number of broken rolls to a minimum.

In my opinion, there are two main causes for broken mill rolls: The first, and most frequent, is due to shock which is created when the stock is fed into the bite of the rolls; the other is due to uneven thickness in the walls of the roll, caused by the core floating in the casting of the roll.

When the walls of a mill roll are not uniform in thickness, the constant stress and strain on the metal, which is known as fatigue, weakens the structure and results in a crack across the role. I have had cracks open up on rolls in this manner when the roll was covered with soft stock. Usually, when this occurs, the manufacturer makes an adjustment on a new roll.

Breakage Due to Carelessness

When a roll is broken by a shock, it is due to nothing but carelessness on the part of the man operating the mill. If the rolls are not in proper alignment, a slight shock may cause a break. We have experienced broken mill rolls due to a small piece of rubber being carelessly thrown on the mill, or a piece of stiff stock doubling as it enters the bite of the rolls. If material is put in the mill at the middle of the rolls, when screws are not set up, a broken roll may result. All these things create shocks and too often cause broken rolls.

Instructions for feeding stiff and tough stocks into the mills include "Set the screws up to bearings and start stock through mills close to guide at bull gear end of rolls (this is to minimize the shock as the rolls catch the stock). Cut all stiff stock in small pieces before putting on mill."

Care in Milling Stiff Stocks

When mixing stock which has a stiff non-productive, we leave a piece of the batch on the mill to keep the rolls apart and then add the new batch to it by placing the master directly in the soft stock. This eliminates the shock. However, care should be taken not to let the small piece of batch on the mill too long or the vibration of the mill will first crowd and then release, the pressure causing the roll bearings to leave the end of the screw.

As another measure to prevent the breaking of mill rolls, we have a rule, which is very strictly adhered to, that any mill man breaking a perfect roll is either temporarily laid off or discharged. He is usually discharged, as we find that most of our broken rolls are due to nothing but carelessness on the part of the mill operator.

Twelve Rolls Broken in 1927

During the year of 1927 we replaced twelve mill rolls, at a cost of about $5,000.00, as follows: Four 84-inch, six 30-inch (cracker), and two 60-inch (warming) mill rolls. For these twelve broken mill rolls, eight men lost their jobs. Of the four men who were not discharged, two had rolls with the cores off-center, and two were cracker operators breaking down tiling stocks.

We have done some experimenting with hydraulic screws, but, as yet, have obtained no satisfactory results, although the dials showed quite a variation between the two ends of the rolls.

Are Safety Caps Worth While?

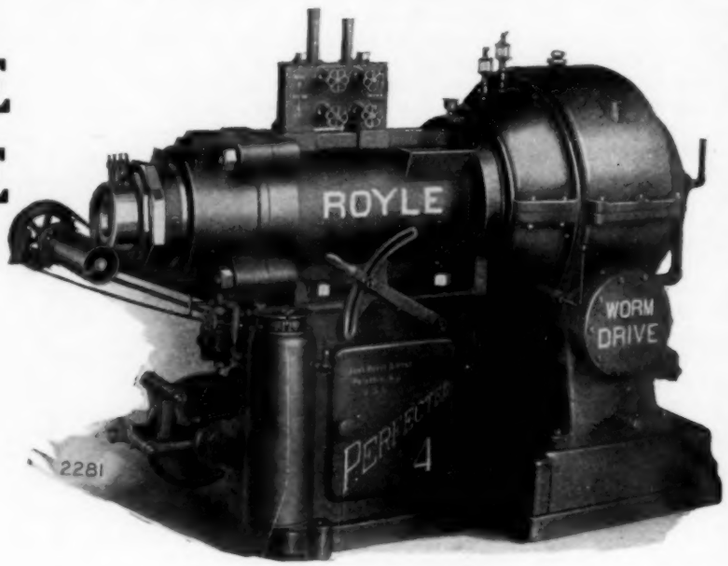
We hear, at our plant, a great deal about safety caps, the question being whether or not they are worthwhile.

The caps we use are made to withstand a breaking pressure of 3,500 pounds, but, during the last three weeks, on a new line where we are sheeting out tread stock from the Banburys, we have broken twelve of these safety caps. Do you think it was pressure from the warm stock that broke these safety caps? I doubt it, and believe it was nothing more than the shock against the mill screws that broke them.

For two years we have had a mill on which a shoulder is cut on the end of the screws and a plate set in and bolted to the boxings. Needless to say, the rolls on this mill have not broken, but the fly in the ointment, in this particular case, is the fact that the screws are likely to stick if the shoulder or threads of the screws are bent a little bit.

In conclusion, I wish to say that I do not think the use of safety caps is the solution of this problem. I believe a screw hook up with the bearing and controlled by hydraulic or some other mechanical device and a mill man with intelligence to follow instructions will solve the problem.

ROYLE 6-Inch INNER TUBE MACHINE



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EDITORIAL COMMENT

The Reach Should Exceed the Grasp

AMERICAN consumers of rubber, like everyone else concerned with the commodity, have been much interested in the revealing speech made in Malaya by Mr. Ormsby-Gore, British Under-Secretary of State for the Colonies. Probably due to his being so far from home, this official has proved more loquacious than any other British official who has been connected with Britain's unfortunate attempt to legislate the price of rubber.

The final impulse which brought about the recent investigation of rubber restriction, Mr. Ormsby-Gore says, was the ever-increasing use of reclaimed rubber. And then, in response to a direct question, he declared that it was the high pivotal price set by the amended Stevenson scheme which finally wrecked restriction. The great increase in rubber production outside the British areas was pointed out as being an enormous factor well known to everyone.

It is, of course, not surprising that the Under-Secretary's serious and apparently sincere remarks met with disapproval in London. They were immediately held up as proof of the ignorance with which the British government had dealt with the entire rubber question. In particular, Mr. Ormsby-Gore's statement about reclaimed rubber displeased the British rubber interests. This material, the contention is, played nowhere near the powerful role which the speaker assigned to it. Since the relationship between the consumption of reclaimed and crude rubber has advanced from 20 per cent in 1922, the year in which restriction was adopted, to nearly 50 per cent in 1927, it would seem that there was something to be said for Mr. Ormsby-Gore's argument.

The more surprising thing, however, is the silence with which London rubber interests received the official's thrust about the high pivotal price being the factor which finally wrecked restriction. If he was answered on that point, it has been done in a manner so quiet as to attract little or no attention. As a matter of fact, this silence is a part of the same silence which greeted the increases in the pivotal price when they were made. The surprisingly little attempt which has been made to justify the increases at any time leads one to believe that their fairness, and perhaps their wisdom, was questioned when they were made.

Boosting the original pivotal price of 30 cents per pound to 36 cents and thereafter to 42 or 48 cents was not the work of the Colonial Office, Mr. Ormsby-Gore reports. Instead, he says, that grave economic error is directly chargeable to Lord Stevenson and the advisory committee which was made up chiefly of men interested in rubber plantations.

And why did these gentlemen choose to shove the pivotal or demanded price so far beyond what was originally proclaimed as the fair price? If we are willing to be blunt for a moment, we may truthfully reply that it was because they thought they could get it. The success of the scheme being not doubted, there appeared to be no good reason why they shouldn't have 36 or 42 cents for their rubber, instead of the modest 30 cents which they originally asked.

The ethical or moral side of the old quotation to the effect that a man's reach should exceed his grasp may be neglected, since instances, in America as well as in Britain, are not wanting where a business has capitalized fully on its advantages. Greed isn't a pretty thing to talk about, anyway. But all business men will be interested in this commercial boomerang where the failure to be content with a fair return quickly destroyed the advantage which existed. Had a real effort been made by the restrictionists to stabilize the price of rubber at around 30 cents after that fair price had been reached, it is quite possible that restriction would have proved the high claims made for it. Certainly both the producers and the consumers would have been spared the loss and confusion of the present season.

Greeting Los Angeles

FIFTEEN years ago the rubber manufacturing industry in the United States was one of the most centralized businesses of the country. Akron was justly known as the "Rubber City". Skilled labor in rubber manufacturing was pretty well limited to that one district in Ohio. But the use of the automobile, and, with it, the manufacture of tires, has expanded enormously in the last decade. As a part of that expansion, and without challenging the supremacy of Akron, other centers have become important in rubber manufacture. The latest, and apparently the one due to take second rank, is Los Angeles. The Goodyear, Goodrich and Firestone plants built or under construction in that city mean a total capacity of many thousands of tires each day. The rubber industry, like the movies, greets this western city, and promises to have a big part in its future growth.

The RUBBER AGE

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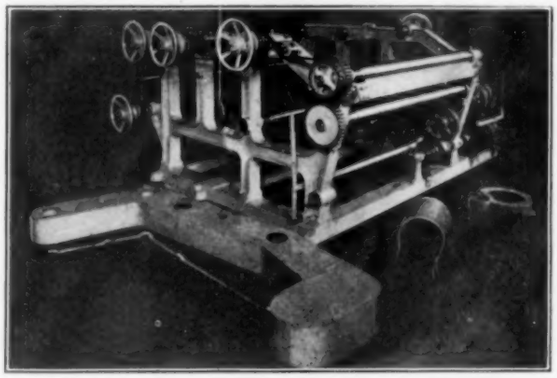

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NEWS of the INDUSTRY

Financial-Business
Building Operations
Personals
New Products

AUTOMOBILE OUTPUT CLIMBS TO NEW PEAK

Factory Shipments During April Shows Several New Records in Production—Packard, Hupp, Graham-Paige and Others Show Gains.

REPORTS from the automobile industry of the production of passenger cars and trucks during April indicate that the high rate of production made during March is being maintained and in the case of several of the companies new records were established . For the first three months of the current year the production of both passenger cars and trucks has totaled 968,032 vehicles as compared with 938,133 for the same period in 1927.

The production of the new Ford Model A car is now 2,300 units a day, according to an announcement by Edsel Ford. By the first of July Mr. Ford predicted that production will be 5,000 cars a day. More than 100,000 cars of the new model have already been produced, he said, while unfilled orders on hand are in excess of 800,000.

Shipments of Oakland and Pontiac cars from the Oakland plant last month were 27,061, as compared with 27,546 the previous month and 19,926 in April, 1927. A total of 100,004 units was shipped in the first four months this year, as against 54,653 in the corresponding period last year.

Graham-Paige Output Climbs

Packard production in April established a new record at 4,434 cars, as against 4,428 in March, 1928. The output of Graham-Paige Motors totaled 8,275 cars, a gain of 5,455 over the same month last year. The total production of Graham-Paige for the first four months this year was 21,407, compared with 8,783 in the same period last year.

Shipments of Dodge Brothers cars and trucks from all American plants in April totaled 22,533, against 14,272 in April, 1927, a gain of 57 per cent. For the first four months of the year shipments totaled 82,943 units, as against 60,838 in the like period last year.

Production at the Hudson Motor Car Company plant in Detroit exceeded 28,000 cars in April, despite a rearrangement of machinery. The year's production of Hudson and Essex cars is about approximately 120,000 cars. May schedules call for a larger production than April.

Reo Motor Car Company shipments in April were 5,277 units, compared with 3,539 in March and 5,519 in April, 1927. April shipments of Hupp automobiles were 8,082, exceeding a year ago by 3,971 units or 96 per cent. Hupp shipments for the first four months this year were 24,952 units, compared with 15,915 in the corresponding period last year.

LOS ANGELES PLANT FORMALLY OPENED

The Pacific coast plant of the B. F. Goodrich Company, at Los Angeles, was formally opened with appropriate ceremonies on May 2 and production will immediately be started in full swing. Construction of the plant was begun last August and the first tire was produced March 16 of this year. Since then the final touches have been given the plant and all necessary machinery for quantity production has been installed.

James D. Tew, president of the company, and T. B. Tompkinson, comptroller, attended the opening. A radio program of the inauguration ceremonies was broadcast through six Pacific coast stations in the west and through the Red network in the east.

April production of Durant automobiles at the factory in Elizabeth, N. J., was 11,000 cars, with shipments to dealers amounting to 10,781. The Durant production schedule for May calls for 13,000 cars.

The Chevrolet Motor Company reports a production during April of 132,000 cars and trucks, or practically the same as the high March figure of 133,657 units.

GOODRICH MOVES FROM FAMOUS OLD QUARTERS

The executive offices of the B. F. Goodrich Company have been moved from the famous Goodrich Building, 1780 Broadway, to 27-37 West 60 Street, New York City. The former headquarters, an imposing building erected by the company in 1909, has been the scene of many important conferences and happenings affecting the rubber industry of the United States. The building was sold by the company late in 1927 but occupancy was retained until May 1 when the move to new quarters was made.

British Rubber Trade Gains

Great Britain's imports of rubber manufactured goods for March were valued at £384,647, an increase of £156,476 over the corresponding month of 1927 and of £132,984 over March, 1926. Exports of rubber goods for the month amounted to £324,016, an increase of £42,756 over the previous March and a decrease of £4,741 over March, 1926.

FORD'S BRAZIL GRANT CONVEYS WIDE POWERS

Para Newspaper Publishes Copy of Official Contract—Concession Allows of Expropriation of Land Needed for Future Developments.

THE terms of Henry Ford's Brazilian concession contract with the State of Para, covering a wide area of rubber lands, has been published by a Para newspaper, and if the text as given is a true copy, it discloses that Ford has not only been given full control over the vast area ceded to him, but may expropriate further lands needed in future developments. The newspaper containing the alleged contract is the *Folha de Norte*, of Para, which has been waging a bitter fight against the Ford grant.

The contract as published contains twenty-eight articles, including:

Unlimited permission to engage in commerce, industry, banking, navigation and contract labor wherever it is convenient, none of these activities to be subject to government inspection.

Permission to operate an unlimited number of subsidiary companies free of all municipal or provincial taxes.

Permission to import materials free of federal duties.

Permission to exploit corstruction of highways and railroads from Santarem to the limits of the Ford concession, including expropriation of lands deemed necessary.

Any fiscal control of the Ford interests by the State of Para will be through the medium of chartered accountants.

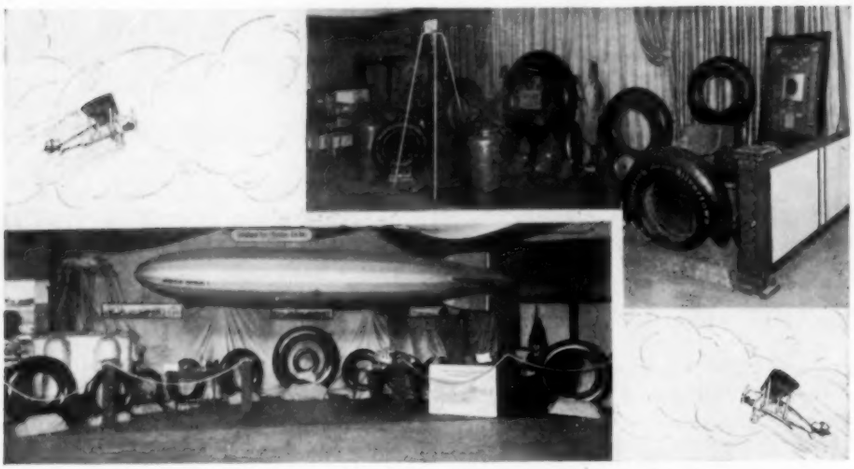
Tire Pressure Campaign

A. Schrader's Son, Inc., manufacturers of valves and valve parts for inner tubes, have published the first advertisement in a broad campaign to educate motorists in the necessity for maintaining correct inflation pressures. Eighty per cent of all tire failures are claimed to be due to under-inflation and the entire series of advertisements, which will run in several nationally-circulated magazines, will deal with the desirability of regular weekly testing of pressures and the keeping of valves and valve parts in good condition.

Feature Advertising of Heels

That the lowly rubber heel as an advertised article has risen to the same important class as the automobile or other nationally advertised article is proved by the two-page spreads appearing recently in the leading weekly publication. The advertisement of Goodrich heels in the April 7 edition of the *Saturday Evening Post* is claimed to be the most expensive display on rubber heels that has appeared to date.

Rubber at the Aeroplane Show



Exhibits of the B. F. Goodrich Company and the Goodyear Tire and Rubber Company at the Recent Aeroplane Show Held at Detroit, April 14-21.

MARCH SETS RECORD FOR AUTO PARTS INDUSTRY

The automotive parts and accessory industry had in March the greatest month in its history and has excellent chances of making the first half of 1928 a record six months. Makers of motors, bodies, and other parts and accessories for original equipment of cars and trucks reported shipments in March far ahead of February and of March last year and exceeding the pace of October, 1925, which had held the record, according to compilations of the Motor and Accessory Manufacturers' Association.

The heavy volume of original equipment business, prompted by the extensive operations of car and truck makers, was supported by a large March distribution through the wholesale trade of parts, accessories and garage machinery and tools. The three latter classifications did not establish new records in March but business was substantially greater than in January and February and well above any average month of recent years.

April production schedules indicated only a slight falling off from March and orders on hand promised no more than an orderly seasonal decline until mid-year.

Discuss Footwear Marketing

The Akron Retail Shoe Dealers' Association met for dinner and a business session on April 16 at Eisinger's restaurant in Akron. The subject for discussion was "Rubber Footwear." Following the business meeting in the afternoon, the group went to the plant of the B. F. Goodrich Company for a tour of inspection of the rubber footwear department.

New Rubber Heel Company

The Monarch Rubber Company has been recently organized in Baltimore, Md., by Irving Katz, formerly vice-president and sales manager of the Holtite Manufacturing Company, also of Baltimore. The new concern will concentrate on the manufacture of rubber soles and heels and has erected a modern plant at the corner of Philadelphia Road and Third Street, Baltimore. The factory is already producing and the line is on the market under the trade name of "Monarch."

Irving Katz is secretary and treasurer of the new concern, with Solomon Schwaber as president and Ed Engelberg as vice-president.

CORD TIRE CORPORATION NAMES NEW EXECUTIVES

Several changes have been recently made in the executive personnel of the Cord Tire Corporation, of Chester, W. Va., which is being operated under a friendly receivership. W. H. Hoover, formerly of the B. F. Goodrich Company and Norwalk Tire and Rubber Company, has been made factory superintendent. C. A. Yoos, also formerly of the Norwalk company, has been appointed general sales manager. V. W. Peterson recently assumed the position of president of the company, succeeding J. D. Comstock.

Balloon Race at Pittsburgh

The National Aeronautical Association has awarded the national elimination balloon race to Pittsburgh. It will be held on May 30, starting at Bettis Field. The winners of the first three places will comprise the American team to be entered in the Gordon Bennett international balloon race which will start from Detroit, June 30.

The winner of the national contest will be awarded the second Litchfield trophy. Wade T. Van Orman won the permanent possession of the first Litchfield trophy by securing his third consecutive victory.

The plant of the Silver Lake Company, at Newtonville, Mass., manufacturers of braided cord formerly used in tires, which has been idle for seven months since the removal of the machinery to a Georgia location, has been sold to the National Packaging Machinery Company.

SPECIFICATIONS FOR HOT WATER BOTTLES, PILLOWS

The Federal Specifications Board, which is adopting and promulgating purchase specifications for commercial commodities purchased by the various departments and establishments of the United States Government, has drawn up tentative specifications for rubber hot water bottles, rubber air pillows, surgeon's aprons, fountain syringes and rubber sheeting.

These specifications, in the formative stage, are being submitted to representative manufacturers for their comment and criticism.

Any comments or suggestions as to changes which may be thought to be desirable in the specifications should be in the hands of the board not later than June 1.

Trenton Has "Rubber Night"

Rubber manufacturers of Trenton, N. J., recently celebrated "Rubber Night" at the Trenton Carteret Club. About 300 persons were present, and prizes and novelties were distributed. Clifford H. Oakley, president of the Essex Rubber Company, showed a film entitled "The Growing of Rubber in India." The members of the committee in charge of the event comprised A. Boyd Cornell, Albert W. Alexander, William R. Dolton, General C. Edward Murray, C. Edward Murray, Jr Neil E. Bowman, Milton H. Martindell Charles L. Fulkert, George T. Grette Charles E. Stokes, R. Robert Lee and F Lambert.

New British Rubber Co.

The Trowbridge Tyre & Rubber Company, Ltd., has been formed at Trowbridge, England, to carry on the manufacture and sale of the "Spencer Moulton" tires. It is understood that George Spencer Moulton and Company, Ltd., of Bradford-on-Avon, has a large financial interest in the enterprise and is represented on the board of directors. Lionel Caswell, formerly of the Spencer Moulton organization, has been appointed managing director. The new company, however, will have its own plant and will operate as a separate concern. Tire contracts entered into by the Spencer Moulton Company will be executed by the new Company.

McKone Company Expanding

The McKone Tire and Rubber Company, of Millersburg, O., reports that through effective sales agencies their sales have increased and that their representation now extends from North Carolina and Connecticut in the east to Minnesota in the north and west. With the sales organization now complet the officials of the company look forward to increasing the daily output from the present rate of 100 tires a day to 1,000 within the course of the year.

It is reported that the receiver of the McGraw Tire & Rubber Company, of East Palestine, O., will shortly apply to the United States district court for an order to permit the sale of the property and entire holdings of the company.

CABOT, INC., BUILDS NEW CARBON BLACK FACTORY

Construction has started on a new carbon black plant near Pampa, Texas, which will have an initial daily capacity of 30,000 pounds. This plant is being built by Godfrey L. Cabot, Inc., who have only just completed the first two units of another large plant at Skellytown, Texas. Both at Pampa and at Skellytown, room has been left for further increase in plant capacity as soon as market conditions justify it.

The Cabot interests also own a plant at Eliasville, Texas, having a daily capacity of 25,000 pounds. The production of all companies in Texas now exceeds 200,000 pounds per day, and it seems probable that Texas will soon pass Louisiana in production of carbon black.

All carbon black which they are producing in Texas is made from residue gas discharged by gasoline plants and formerly blown into the air. The residue gas is a by-product of the production of oil and gasoline.

Shipments of carbon black have been above expectations and the Godfrey L. Cabot, Inc., plan to spend over $600,000 this year in expanding their producing capacity.

PNEUMATIC TIRES TO GO ON LONDON BUSES

The London General Omnibus Company, which operates the largest bus fleet in the world, hopes to have 75 double-deck buses of an improved type on the streets by the end of the year. These new vehicles will be equipped with pneumatic tires. They will seat 50 passengers, as against 54 in the present type of bus in London, and will thus provide more room and greater comfort.

In addition, 100 of the existing type of vehicle will be altered so that they can be mounted on pneumatic tires. Hitherto, the traffic authorities have refused to permit any but six-wheel buses to operate on pneumatic tires. The object of the new scheme is to test the practicability of fitting pneumatic tires throughout the fleet of the London bus combine. Should this course eventually be decided upon, it is certain to be followed by many of the independent bus fleets operating throughout the United Kingdom.

Gates Exports Increase 100%

The Gates Rubber Company, Denver, Colo., reports a steady increase in its export business. The company exports to over sixty countries outside the borders of the United States. Each month since the beginning of 1928, the company has broken all previous monthly records so far as its own exports are concerned; and the year's first quarter showed a 100 per cent increase over the corresponding period in 1927.

Charles C. Gates, president of the company, just returned from a three months' survey of business conditions in South America, has expressed himself as profoundly impressed with the possibilities offered by the Latin-American countries.

Offers $500 in Prizes

The suggestion committee of the Goodyear Tire & Rubber Company, Akron, have announced that cash prizes totaling $500 will be awarded to employees for the best suggestions made during the current year. The money will be split into five prizes and will be paid to the suggestors in addition to the regular company awards. All ideas advanced by employees and adopted during 1928 will be considered in making the awards.

The Murray Rubber Company, Trenton, N. J., has begun suit against the Mercer County Freeholders for $168,000 damages alleged to have been sustained by the company because of floods of the Assunpink Creek during the past three years. It is alleged that county bridges over the stream impede the flow of the stream and cause the water to enter the company's plant.

OREGON TIRE COMPANY SOLD AND REORGANIZED

The old Columbia Tire Corporation of Portland, Oregon, has been purchased and a reorganization is planned by the new interests, according to a statement from J. H. Gensler, chairman of the stockholders. The company was purchased for approximately $250,000 and will be reorganized as the C. T. C. Tire & Rubber Company, with a capitalization of $300,000 and fixed assets of $425,000.

According to Mr. Gensler's statement, the Columbia Tire Corporation was forced to suspend operations some time ago because of lack of capital. Recently the old stockholders have been invited to subscribe.

J. F. Cullen, formerly engineer and manufacturing manager of the old corporation, will act as president and general manager with the new concern. The old plant has been overhauled and it is reported that production in tires and mechanical goods will begin soon.

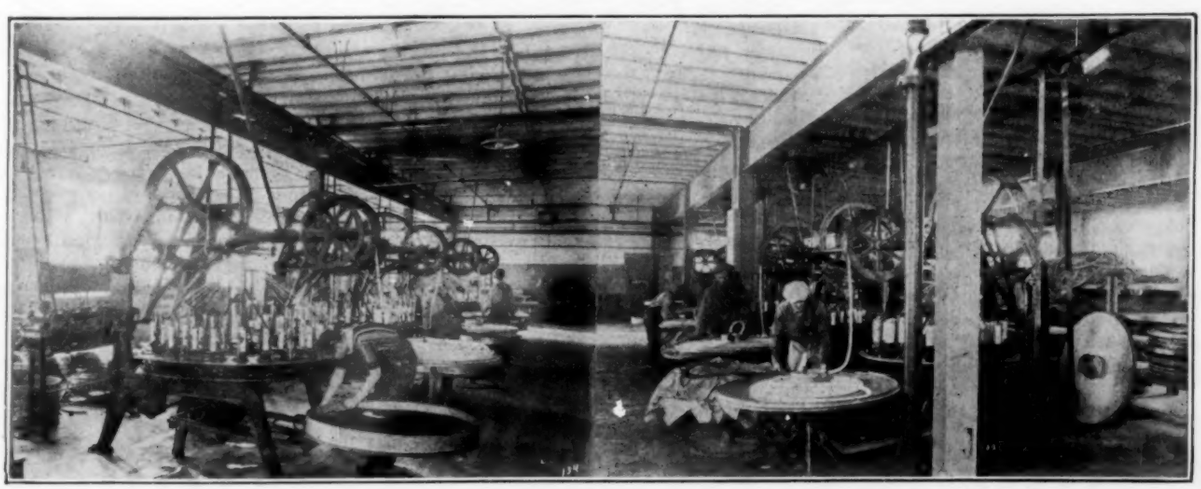
Trenton Tire Dealers Combine

The Trenton Tire Dealers' Association has been formed in Trenton, N. J., and an organization meeting has been scheduled for the middle of May, when officers will be elected. The charter members include seventeen dealer concerns. All the members of the new association are also members of the Trenton Credit Association and the Trenton Chamber of Commerce. The association has adopted as its slogan "Only tires you can trust—sold and serviced by people you know all about."

Rubber Boat Company Moves

The Pneumatic Boat Corporation, Inc., have moved their factory and offices from 102 Murray Street, Newark, N. J., into larger quarters at 122 Branford Place, Newark, to enable them to manufacture on a larger scale their portable "Pnumaticraft" boats, pontoons and life rafts.

Lead Press Hose Plant at Denver, Colorado



The new hose braiding department of the Gates Rubber Company has a capacity of six miles of hose per day and is the only lead-press hose plant west of Akron, Ohio.

PHYSICAL TEST REPORT TO BE AVAILABLE SOON

The physical testing committee of the Rubber Division of the American Chemical Society will soon have available a final report on the effects of temperature and humidity during the preparation and testing of rubber compounds, according to advance notice in the *Technical News Bulletin* of the Bureau of Standards, Washington, D. C. The progress report of the committee was published in THE RUBBER AGE of December 10, 1927.

This report presents complete data and final conclusions based on experiments conducted at the Bureau of Standards. A comprehensive study was made with five cures of five typical compounds, involving several thousand tests, in which the humidity, temperature, and periods of exposure were varied, both prior and subsequent to vulcanization. Photographs are included showing the apparatus used in conditioning the samples. Test methods are described in detail, and the results are given in 52 tables and 98 charts.

Data obtained show that previous to vulcanization relative humidity has a pronounced effect upon the stress-strain relation, while that of temperature within the range studied is practically negligible. Differences due to relative humidity vary both in degree and kind with the ingredients used. Length of exposure of compounds has an appreciable effect. Subsequent to vulcanization, relative humidity has but slight effect, while that of temperature is pronounced. The effects due to temperature are not changed materially in the compounds studied by the compounding ingredients. Copies of this report will be available to those interested through the physical testing committee of the rubber division of the American Chemical Society and can be obtained when issued by addressing the chairman of the Physical Testing Committee, J. E. Partenteimer, Fisk Rubber Company, Chicopee Falls, Massachusetts.

Henry L. Scott

Henry L. Scott, president and founder of Henry L. Scott Company, manufacturers of testing apparatus used in the rubber industry, died April 27 in Providence, R. I., at the age of forty-nine years. He is survived by his wife and one daughter.

Mr. Scott established the firm of Henry L. Scott Company in 1899 and was later joined by his brother, the concern operating as a partnership up to January 1, 1927, at which time it was incorporated, with Henry L. Scott as president and David G. Scott as treasurer.

He was a member of many technical societies, including the American Society of Mechanical Engineers, Textile Institute of Manchester, England, and American Society for Testing Materials.

Mr. Scott had a great deal of interest in the Textile Committee D-13, American Society for Testing Materials, and for several years served as one of the Executive Committee of the Society. He was a man of a great deal of ability in many lines, and combined the rare qualities of a financier, inventor and manufacturer.

His poor health for the past few years has not permitted him to be as active as he desired in the management of the business, and for the past two years he has been in semi-retirement, the business having been managed by his brother, who will continue it, following out the same policies and administration of the affairs of the business.

CATALPO!

SEES INTERNATIONAL TEAM WORK AIDING TRADE

Dr. Alberto Pirelli, prominent rubber manufacturer of Italy and president of the International Chamber of Commerce, recently arrived in the United States to attend the annual meeting of the Chamber of Commerce of the United States, to be held in Washington, May 7-11. In a brief interview with members of the press, he spoke optimistically of the present state of the world's business.

"World business men," Dr. Pirelli said, "have came to realize the value and benefit growing out of closer team work. Evidence of this is shown by the results already achieved by the pooling of interests of the business men of forty-five nations represented in the membership of the International Chamber of Commerce. It was through their initiative to a large extent conditions were created which made possible the realization of the Dawes plan. It was their contribution which did a great deal to assure the success of the world economic conference at Geneva last year at which definite suggestions for elimination of trade barriers were put forward."

Dr. Pirelli, who has rubber factories in Italy, England, Spain and Argentina, was a member of the Dawes committee and the Italian Debt Funding Commission.

I. R. I. Dinner

The sixth annual dinner of the Institution of Rubber Industry was held in London on April 26. Lord Colwyn, president of the Institution, presided. The chief guest of the occasion was Sir Eric Geddes. The dinner was not only attended by the leading rubber manufacturers throughout Great Britain but the plantation industry was also well represented. In the course of the speeches the principal uses of rubber were presented by the two vice-presidents of the Society of Motor Manufacturers and Traders, E. H. Blake, of Morris Motors, Ltd., and A. F. Palmer Phillips, of General Motors.

Canvas-rubber-soled-shoe-wearing-time is approaching and May will be the month for the widest display of such rubber footwear. The *Boot & Shoe Recorder*, in calling attention to the effectiveness of timely and appropriate window displays, estimates the number of store display windows in the United States at 1,300,000 and urges merchants to make their display sometime around or in conjunction with "straw hat day," which is May 15.

RUBBER EXHIBITS AT THE LONDON BUILDERS' SHOW

The Building Exposition which has just been held in London included a number of exhibits of rubber manufactured goods. The various uses of rubber in modern building practice were well illustrated on the stands of the various rubber concerns represented.

The outstanding feature of the Rubber Growers' Association stand was a sound-proof room, to demonstrate the sound-resisting properties of rubber. Specimens of the new sponge rubber carpeting and rubber paving were also effectively displayed.

A brilliant sunset scene, built up entirely with colored rubber tiles, was the most notable feature of the "all-rubber" stand of Charles Macintosh & Co. The floor was covered with rubber tiling in the latest designs, and a new feature was the rubber-covered pillars and facia boards. Another innovation was a rubber-covered bathroom, in which there was a cove base, bath curtain, mats and a large non-slip bath mat, all made entirely of rubber, as was, of course, the floor. There were also exhibits on the stand of the numerous rubber sundries employed in the building trade.

The stand of the North British Rubber Company was attractively designed in the Cubist style. Prominently featured were a number of rubber flooring designs, in artistic colorings, for public buildings, banks, offices, hospitals, theaters, hotels and similar buildings. "Paraflor," a flooring made in various thicknesses and in plain and marbled colorings and widths, was also shown. In addition, the firm showed new stair treads in colors, rubber mats and matting for entrance halls and corridors, sundries, such as valves, washers, draught tubing, door stops and rubber products for contractors and road engineers.

Grasselli Announces Move

The Grasselli Chemical Company have announced that they have removed the headquarters of their rubber service department from New York City to their home office in the Guardian Building, Cleveland. A branch office, however, to handle the eastern territory, will be maintained at 347 Madison Avenue, New York City. The company states that the move is being made so as to bring together the rubber research, service, manufacturing and sales departments in the interests of more efficient service.

The Hilder Rubber Company, Ltd., Toronto, Canada, is offering for public subscription 7,500 shares of no part value common stock at $10. per share. The proceeds, it is understood, will be used for the purpose of enlarging the capacity of the company's plant at Toronto. The company are manufacturers of patent inner tubes for automobile tires.

CATALPO!

Names in the News

GATES FERGUSON, advertising manager of the B. F. Goodrich Co., presided as chairman at a recent meeting of the Akron Advertising Club held in the Hotel Portage ballroom, Akron. Several members, including Mr. Ferguson, enrolled for the trip to the International Advertising Association Convention in Detroit to be held in June.

FRANK WEBBER, sales manager of the Plymouth Rubber Co., Canton, Mass., has returned from a business trip throughout the Middle West.

C. S. CHING, supervisor of industrial relations of the United States Rubber Company, was elected president of the American Management Association at its recent annual meeting.

CLIFFORD H. OAKLEY, president of the Essex Rubber Company, Trenton, N. J., is an active worker for the Boy Scouts of America. Mr. Oakley announces that he has secured the 62-foot motor boat, *Ballantrae*, from Robert G. Roebling, of the John A. Roebling's Sons Company, for use of the Scouts.

WILLIAM J. B. STOKES, prominent Trenton rubber manufacturer, has been spending a month in Bermuda with Mrs. Stokes.

E. G. UPCHURCH and J. M. HOWER, two sales managers of the Murray Rubber Company, Trenton, N. J., have been promoted by the company and have larger fields to cover. Mr. Upchurch, of Montgomery, Ala., has been made factory representative with a territory covering North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Louisana, Texas, Mississippi, Oklahoma and Arkansas. Mr. Hower, of Boston, Mass., has been advanced to the same position and is covering Connecticut, Massachusetts, New Hampshire, New York, New Jersey, Rhode Island, Pennsylvania, Delaware, Virginia and West Virginia.

J. EDWARD MYERS, superintendent of the Acme Rubber Manufacturing Company, has been elected treasurer of the William McKinley Memorial Hospital, Trenton, N. J.

HORACE T. COOK, president of the Hamilton Rubber Manufacturing Company, Trenton, N. J., has erected a modern winter home at Mountain Lakes, Florida.

WILLIAM R. DOLTON has been appointed secretary of the Murray Rubber Company, Trenton, N. J. He was formerly factory manager of the concern.

HARVEY S. FIRESTONE, SR., has returned from his winter vacation in Florida and made his first public appearance at the Akron City Club, April 19, where he addressed the workers in the City Hospital fund campaign. He incidentally took the occasion to add $25,000 to the $350,000 which he had already contributed to the hospital fund.

M. W. MCNAULL, formerly head of the pneumatic sales department of the General Tire & Rubber Company, Akron, has been promoted to head the bus and truck sales division of his company. J. E. JAMES, of the sales department, has been named to succeed Mr. McNaull in his former position. JOHN INK, also of the sales department, has been appointed assistant to Mr. McNaull.

TRESS E. PITTENGER has been appointed superintendent of the Los Angeles plant of the Firestone Tire & Rubber Company. The plant, which is in the course of erection, is

T. E. PITTENGER

nearing completion. Mr. Pittenger is only 33 years of age but has been with the Firestone organization since the year of his graduation from Ohio State University in 1916. Prior to his recent transfer, he was superintendent of the Firestone factory at Hamilton, Ontario, where he went five years ago as chemist.

MARK L. FELBER, formerly publicity director of the Firestone Tire & Rubber Company, Akron, has announced that he has assumed the position of editorial director of a chain of newspapers on the Pacific Coast and that his headquarters will probably be in San Diego, California. Mr. Felber was editor of the *Akron Press* for six and a half years prior to his connection with the Firestone interests. He had been with the Firestone Company seven and a half years.

JOHN B. TUTTLE has joined the Woburn Degreasing Company where he will have charge of sales to the rubber industry of oils and greases. The Woburn company has plants at Woburn and Peabody, Mass.; Waukegan, Ill., and Harrison, N. J. Special softeners for the rubber industry will be manufactured and sold under Mr. Tuttle's direction.

B. STADHOLZ has recently been appointed eastern representative of the Smith Chemical & Color Company, of New York City, manufacturers of the "Smithko" brand of chemically produced dry colors, earth colors and pigment fillers used in the rubber industry. Mr. Stadholz is a technician of long standing and has a wide acquaintance in the rubber chemical field.

W. A. HAZLETT, manager of the eastern division of the Goodyear Tire & Rubber Company, presided at a recent meeting of 250 Goodyear dealers in the eastern territory, held at the Robert Treat Hotel, Newark, N. J.

T. C. Moss, formerly with the Trenton Wholesale Drug Company, of Trenton, N. J., has joined the sales force of the Davol Rubber Company, of Providence, R. I., and will cover the southern territory from Virginia to Texas, calling on the wholesale drug and surgical supply houses.

A. L. KRESS, of the United States Rubber Company, recently spoke before the Taylor Society, at a meeting in Detroit, on the subject of methods of observation in time studies. The Taylor Society is an international organization to promote the study of administration and management in business.

FRANK LEAHY has been elected to the board of directors of the Ajax Rubber Company in place of J. C. WESTON. At the same meeting JAMES L. MCNAIR was elected also to the board to succeed J. C. MAXWELL, deceased.

EDWIN J. THOMAS, personnel manager of the Goodyear Tire & Rubber Company, has been appointed general superintendent of the company's Los Angeles factory. Mr. Thomas is only 29 years old and thus becomes one of the youngest executives in the rubber industry. He has risen from a stenographic position with the company to his present new post.

KARL W. VAN NIX is now associated with R. S. Hardy Company, crude rubber brokers, at 44 Broad Street, New York City, and is not with the Holcombe Rubber Company, as was published through error in a recent issue of this publication.

W. T. VAN ORMAN and WALTER W. MORTON, the veteran ballonists who captured the first Litchfield trophy, will pilot the bag of the Goodyear Tire & Rubber Company in the national balloon races on May 30.

Harold S. Barwis

Harold S. Barwis, purchasing agent for the Essex Rubber Company, Trenton, N. J., died recently at his home at Trenton after a lingering illness. Mr. Barwis was well known in sporting circles and was at one time identified with the local semi-professional baseball league of Trenton. He was the son of the late Dr. Elmer Barwis and was prominent in the Masonic fraternity.

CATALPO!

Timely Financial News

GENERAL TIRE SALES GAIN 28 PER CENT

First Three Months of Current Year Indicates 40 Per Cent Advance in Production—Sales Exceed the Six Million Dollar Mark To Date.

TWO substantial gains, one of 28 per cent in sales and the other a 40 per cent increase in production, mark the recent announcement by the General Tire and Rubber Company on their business during the first three months of the current year. In value the sales for the first quarterly period were well over $6,000,000.

"Plant additions, new machinery and increased shipping facilities have made possible an orderly increase in production in our factories, without the necessity of taking on large numbers of new men," declared William O'Neil, president of the company. "Despite an apparent brisk spring business, it is our intention now, as in the past, to avoid over-production.

"Selling our entire output, as we do, through our own dealers and not being dependent for normal operation upon uncertain orders from large automobile manufacturers, we are in position to sense fairly accurately the moods and buying capacities of tire consumers from season to season.

"Advantages accruing from this close knowledge of our market are reflected in smooth factory operation, where we have steadily and carefully increased forces, but on the other hand have not found it necessary to lay off a single employe for lack of work for more than six years," said Mr. O'Neil.

MERGER AMONG AKRON RUBBER PLANTS DENIED

Persistent reports emanating from Akron to the effect that a group of the smaller tire manufacturing companies will form a merger have been emphatically denied by each of the companies which have been mentioned in this connection. Strength was given to the rumor by the report that Chicago financial interests had acquired two or more companies, following the recent financing of the Mohawk Rubber Company by the Union Trust Company of Chicago, and were using their holdings as a foundation for forming a consolidation.

The companies linked with the rumor, exclusive of Mohawk, include the India Tire & Rubber Company, Falls Rubber Company, Swinehart Tire and Rubber Company, and Lambert Tire & Rubber Company, but officials of each concern have denied that any merger negotiations are pending at the present time.

CATALPO!

MOHAWK LEADS LIST IN RUBBER SHARE SALES

Trading in the stock issues of the various rubber manufacturing companies has been light during the last two weeks, but in a number of instances new high and low records for the year were established. Rumors and scares of lower tire prices have not affected exchange quotations, and the general good health of the rubber industry as a whole has also contributed to keeping values firm. Mohawk Rubber common continues to be the feature of the rubber share list; this stock touched a new high of 140 on April 23, but has since receded to 125. Rumors of a merger of two or three rubber companies, including Mohawk, persist, but have been repeatedly denied by each company which has been mentioned in this connection.

India Tire and Rubber common has also enjoyed a spectacular rise, reaching 45 as a record high mark for the year. This represents a gain of 21½ points during the fortnight. The India company has been one of the companies mentioned in the rumors of a contemplated merger. The last quotation was 33.

Seiberling common has reached 49½ in a recent spurt, which is attributable to the favorable quarterly showing of the company. It is also said to be in a very favorable position as regards crude rubber inventories. Hood and Miller went to new low levels during the fortnight.

Late Stock Prices

	Last Price May 3	Apr. 18	1928 High	1928 Low
Ajax	10⅝	10⅞	14⅜	9¾
Firestone	184	181	232	170
do 6% pfd.	110⅛	110	112	109
do. 7% pfd.	109	109½	111½	108
Fisk	16	15⅝	17¾	14¾
do. 1st pfd.	83	82¾	98	82
General	175	165	190	165
do. pfd.	100½	101	111	100
Goodrich	91⅜	86¼	99⅜	80
do. pfd.	115	114½	115	109½
Goodyear Com.	54⅜	53½	72½	50⅛
do. pr. pfd.	95½	96	99½	96
do. pfd.	100	100	120	100
Hood	33½	—	43	33½
India	33	22½	45	16
Intercontinental	13½	12⅞	21¾	11¾
Kelly Springfield	22⅞	22⅝	27⅝	15
do. 1st pfd.	—	—	78	75
do. 8% pfd.	—	—	84	55¼
Lee	23¼	18⅞	22⅝	17¼
Miller	20	22	27½	20
do. pfd.	72	86	97½	72
Mohawk	120	125	140	29¾
do. pfd.	85	83	85	55
Seiberling	49½	39	49½	35
do. pfd.	104	105	105	102
U. S. Rubber	43¾	45¾	63¼	40
do. pfd.	80	80	109⅝	77¼
U. S. Rubber Reclaiming Com.	—	—	16½	12

KELLY-SPRINGFIELD SALES DROP IN FIRST QUARTER

Sales of the Kelly-Springfield Tire Company for the first quarter of the current year are understood to be 15 to 20 per cent lower in dollar volume than in the corresponding period of 1927. April business, however, is said to have shown some improvement. As a result of the lower sales in the first three months, earnings have been correspondingly lower. It is thought, however, if the present improvement continues the net profit for the first six months of the year will not be materially lower than that of the same period last year.

The company is reported to have carried a very low crude rubber inventory and can therefore profit by the prevailing low price of crude on the present market in replenishing stocks. It is understood that no consideration will be given to any recapitalization scheme until results of the first six months are available and the directors have had an opportunity to forecast the results of the second half of the year.

Ford's Surplus Shows Cut

The financial statement of the Ford Motor Car Company as of December 31, 1927 showed a decline of $42,786,727 in the profit and loss surplus, indicating further heavy cash disbursements in connection with the development of the new Model A. The balance sheet showed that total assets dropped from $784,208,080 at the close of 1926 to $742,056,101 at the close of 1927, and that profit and loss surplus declined from $697,637,788 to $654,851,101 during the same period.

Temporary Shutdown

The Monoblock Rubber Works at New Philadelphia Ohio manufacturers of hard rubber battery boxes was shut down for a week during the latter part of April to enable the plant to make alterations in machinery in order to increase the production.

The Mountain State Rubber Company, organized under the laws of the state of Colorado, and with offices in Denver, has been dissolved by resolution of the stockholders adopted at a recent meeting. All debts owed by the corporation have been fully paid and all its assets distributed.

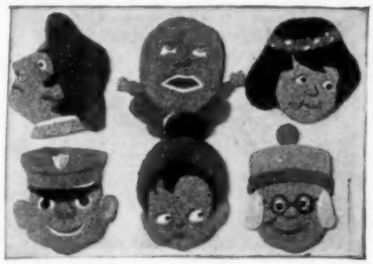
The secretary of the Rubber Exchange of New York, Inc., announces the admission to memberships on the Exchange of the following: Elliot H. Simpson, John E. Sanders, William R. Craig, Alfred B. Strauss, Manuel Weisbuch, Richard T. Harriss and Lawrence G. Odell.

Herron, Rodenbough & Meyer, Inc., crude rubber brokers, announce the removal of their offices from 25 Beaver Street, to 50 Broad Street, New York City.

Rubber Goods and Specialties

Kewties for Kiddies

A sponge rubber bath mitt in fantastic face designs for the kiddies' bath is the latest novelty to be introduced on the market from Germany. The articles are manufactured by the Belinde Company, of Berlin, who are represented in the United States by the J. W. Levy Corporation, 8 West 30th Street, New York City. They can be used as a mitten sponge or a cake of soap



can be inserted in the flap. Belinde Company are putting the novelty on the market under the trade name of "Kewties for Kiddies." The firm manufactures, in addition, a wide range of rubber goods for the bath-room, including mats, curtains and sponges in various colors and designs.

New Tennis Shoe

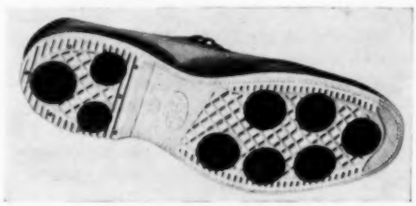
What is claimed by the manufacturers as the fastest tennis shoe thus far made, and one which is four ounces lighter than any other on the market, is the latest innovation in rubber footwear turned out by A. J.

Reach, Wright & Ditson, Inc., Philadelphia, Pa. It is being marketed under the name of the "Speedlite" Tennis Shoe. The sole is of special cushion rubber with the tread which is claimed to grip even on wet grass and which cannot be worn smooth. The published retail price is listed at $3.50 for men and $3.25 for women. The company is offering the new shoe in conjunction with their other well-known line of sporting goods, particularly the famous Wright & Ditson tennis rackets.

Mohawk Truck-Bus Tire

A new truck and bus tire has been introduced by the Mohawk Rubber Company, Akron, O. The chief feature of the new tire is the tread design, which is built with sturdy, column-like supports at the edges, thus distributing the flexing into the pliant side walls. The tire also has two beads, one at the heel and one at the toe, thus preventing the bead from "rocking" on the rim and eliminates chafing and fabric twisting.

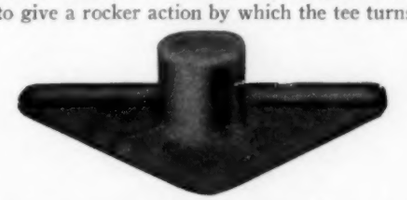
Colored Soles on Sport Shoes



Rubber soles in different color combinations for sport shoes are being offered to shoe manufacturers by the Auburn Rubber Company, Auburn, Indiana, as a new departure in sport footwear. The rubber sole is combined with a leather middle or subsole to provide foot support, comfort and coolness. The manufacturers claim that no change in regular shop practice is necessary to using these soles. Shoe factories cement the soles together and then sew them on as one. Shoe repairmen can cement and sew them to any shoe, direct to the original leather sole, with the soles of different color from the spuds. They are made in gay colors in keeping with the latest popular demand. Each is an organic permanent rubber color and no dyes are used. Extra spuds in packages to cement on can be obtained by the wearer so that the grip can always be renewed.

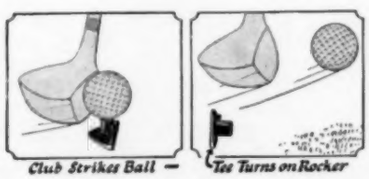
Rubber Golf Tee

A golf tee of molded red rubber is being offered to the sporting goods trade by Par-Tee, Inc., Cleveland, O. The tee is simple in design and will set on any surface, sand, clay, mud, grass or snow and is also ideal for indoor golf, replacing the usual mat. One side of the tee base is rounded so as to give a rocker action by which the tee turns



over as soon as the club comes in contact with the ball, permitting the club to follow through with the least resistance. It does away with the necessity of pressing wooden or metal tees into the ground and, being of rubber, saves the club from marring.

The Par-Tee lasts indefinitely and is easy to carry in one's pocket.



Tee and Match Caddy

A handy all-rubber container for holding golf tees and matches is being manufactured by the Golf Specialties Company of Saginaw, Mich. The device is molded of rubber in one piece. The colors are bright blue and black. Ten wooden golf tees are accommodated by holes in both sides of the caddy. The front of the caddy is slotted to hold a pad of matches or the space can

be utilized for a pad of golf scores which the manufacturer furnishes. For the benefit of those who prefer regular matches to the paper-stemmed book matches, a match scratcher is fitted into the back of the caddy. The device retails for $1.00, complete with score pad and wooden tees.

Dolls With Rubber Hands

Dolls with rubber heads and sparkling eyes and with soft flexible rubber arms and legs are being featured this year by the

The dolls were recently shown at the New York Toy Fair and drew considerable comment. The legs, arms and fingers of flexible rubber give a very life-like appearance and permit the children to set the Ideal Novelty and Toy Company, 273 Van Sinderen Avenue, Brooklyn, N. Y. doll in many postures. The fingers are made so that the doll can actually clasp objects and assume various attitudes.

Colored Golf Balls

Brilliantly colored golf balls are being introduced by American manufacturers to assist the golfer in locating his ball on the course. Thomas E. Wilson & Co., the Chicago sporting goods house, is now offering golf balls in yellow and orange colors. The United States Rubber Company is producing a tiger yellow ball.

Red golf balls have been used to a small extent in the past, both in Europe and America. It is said that they became more popular abroad than in this country but the white ball has remained supreme everywhere.

Current Crude Rubber Items

EXCHANGE HAS QUIET FORTNIGHT OF TRADING

Price Levels Show Firmness After Hectic Market in Previous Two Weeks—Factory Interest is Chief Feature—Last Few Days Has Shown Gradual Gain—May 18.80.

TRADING on the Rubber Exchange of New York during the last two weeks has been quiet, and marked by a steadiness in prices quite in contrast to the sharp fluctuations which prevailed in the early weeks of April. In the face of the firm undertone the price levels have climbed slightly upward, with May closing on May 4 at 18.80 bid from the low record of the fortnight, which was 16.60 on April 23. The sharpest advance occurred on May 4, when prices gained a cent in all positions. Within the last few days a decided revival in trading has been manifested, indicating a renewal of factory interest.

Rubber trading circles seem to have reconciled themselves to the new situation, now that the British government has definitely scrapped their restriction policy and the quiet period of the last two weeks, both in New York and London, is but the natural reaction after the feverish excitement and panicky trading of the previous fortnight.

The statistical position of crude rubber, however, remains practically unchanged. London stocks have been reduced somewhat, but no one is prepared to venture a guess as to what accumulations will occur on the estates prior to November 1. Arrivals of crude rubber during April are estimated at 34,000 tons, which figure also represents the estimated consumption for the month.

The market on the whole has been less speculative than for several weeks previous, and aside from actual deliveries, the trading has been for actual deliveries of nearby positions. Several large factory interests have been particularly active, and it is believed that the factories have allowed their rubber inventories to run too low and are finding it necessary to return to the market for their immediate requirements.

The table below indicates the daily movements and the volume of sales on the Exchange for the last fortnightly period:

FORD PLANS IN BRAZIL UNCHANGED

The abolition of rubber restriction will not affect the development of the Ford concession in Brazil, Henry Ford told British reporters during his visit in London. "We will go ahead with our plans in Brazil without regard to restriction," Mr. Ford is reported to have said. "We may never make a tire for sale, but may turn the entire product over to the manufacturers. We are making a hundred sets a day at present, but only to find out more about tires." The automobile manufacturer declared that he was a free trader and accordingly welcomed the cancellation of restriction.

"DIRT FARMERS" KILLED RESTRICTION, SAYS O'NEIL

The dirt farmer of the Dutch East Indian islands broke the so-called rubber monopoly, ended restriction and demonstrated for all time the impracticability of artificial price fixing of crude rubber, according to William O'Neil, president of the General Tire & Rubber Company of Akron.

Mr. O'Neil said the small farmers, particularly those of the Dutch Colonial possessions, routed the "gentlemen farmers" of the large rubber plantations by going into the rubber business when prices began to climb through operation of the Stevenson act, thereby jumping the estimated annual maximum production of the Dutch provinces from 70,000 tons to more than 250,000 tons.

"It was this tremendous overnight increase, left out of the calculations of the price fixers, that circumvented the blockade effected by the Stevenson act, and which permitted American rubber manufacturers, after a short period of high prices, to go in and buy rubber in quantity at fair prices," said Mr. O'Neil.

"America today may extend grateful congratulations to the industry and enterprise of the old fashioned dirt farmer of the far off Malay Archipelago."

NEW RULES ADOPTED BY N. Y. RUBBER EXCHANGE

Three new rules adopted by the Rubber Exchange of New York, Inc., have recently been put into effect. One relates to the delivery of rubber on dock and another to floor brokerages earned by officers or corporation members.

The third, which relates to contingencies which may prevent deliveries, is as follows: "Whenever through any exceptional contingency deliveries are not possible, and an extraordinary situation arises wherein a rigid enforcement of contracts generally would be grossly at variance with just and equitable principles of trade or the public interest, then upon application of any member, the board of governors, by a two-thirds vote, may accord relief in such a manner as in their judgment the emergency may demand."

Members of the exchange have adopted 17 amendments and additions to the by-laws. The important changes effected include the increasing of the fee on transfers of membership from $100 to $300. Another provides that a member having a claim against another member arising out of an exchange contract shall have a lien upon the membership of the debtor member for the amount of such claim.

R. G. A. Suggests Policy

As a result of the action of the British government in announcing the removal of restriction as of November 1, the Rubber Growers' Association has issued a circular to its members suggesting a future policy for the next six months. It recommends that the managers of estates be instructed to concentrate upon the best crop rather than upon the maximum and to increase the output gradually so as not to pile up too heavy an accumulation of stocks on November 1. It also points out that low prices will probably have a tendency to reduce native output and arrest the consumption of reclaimed rubber. It calls upon the members to look with optimism on the present situation and to resist any inclination toward panicky decisions.

A feature of the annual dinner of the Institution of the Rubber Industry, Manchester section, held recently at the Midland Hotel, Manchester, England, was the menu comprised of four small sheets, the outer of thick crepe rubber and the inner, on which the menu was printed, of ordinary thin red rubber.

Closing Prices on Rubber Exchange of New York, Inc.

APRIL 20 TO MAY 5, 1928

	Date	Spot	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Sales*
Apr.	20	17.00	16.90	17.30	17.50	17.70	17.90	18.00	18.10	18.10	18.10	18.20	18.20		889
	21	17.00	17.10	17.30	17.60	17.90	18.10	18.20	18.20	18.30	18.40	18.40	18.50		286
	23	16.50	16.60	16.80	17.00	17.20	17.50	17.60	17.70	17.80	17.80	17.80	17.80		680
	24	16.60	16.60	16.80	17.10	17.30	17.60	17.70	17.70	17.70	17.80	17.80	17.90		508
	25	17.10	17.00	17.30	17.50	17.70	17.90	17.90	17.90	18.00	18.00	18.10	18.10		657
	26	17.00	17.00	17.30	17.50	17.70	17.90	18.00	18.00	18.10	18.20	18.20	18.20		631
	27	17.10	17.00	17.30	17.40	17.70	17.80	18.00	18.00	18.10	18.00	18.20	18.30		274
	28	17.10	17.20	17.40	17.60	17.90	18.10	18.20	18.20	18.30	18.30	18.30	18.20		119
	30	17.10	17.20	17.40	17.70	17.90	18.00	18.20	18.20	18.30	18.30	18.30	18.40		207
May	1	17.20	17.20	17.30	17.60	17.90	18.00	18.20	18.20	18.20	18.20	18.30	18.30	18.40	471
	2	17.40	17.30	17.60	17.80	18.00	18.10	18.30	18.40	18.40	18.30	18.40	18.40	18.50	490
	3	17.90	17.80	18.10	18.40	18.50	18.60	18.70	18.70	18.70	18.60	18.70	18.70	18.80	955
	4	19.00	18.80	19.10	19.40	19.50	19.50	19.50	19.50	19.60	19.50	19.60	19.60	19.70	1,903

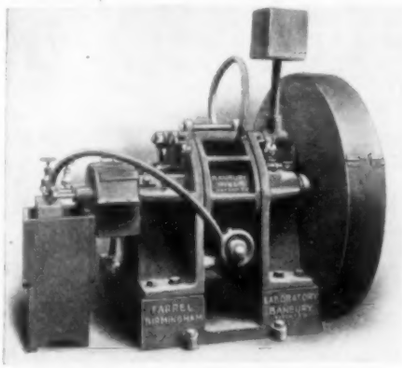
(*) In lots of 2½ tons each

CATALPO!

New Equipment for Rubber Factories

Banbury Laboratory Mixer

A NEW model Banbury mixer for laboratory use has just been announced by the Farrel-Birmingham Company, Derby, Conn. This mixer is suitable for mixing small experimental batches of stocks or for masticating rubber to find



Banbury Laboratory Mixer

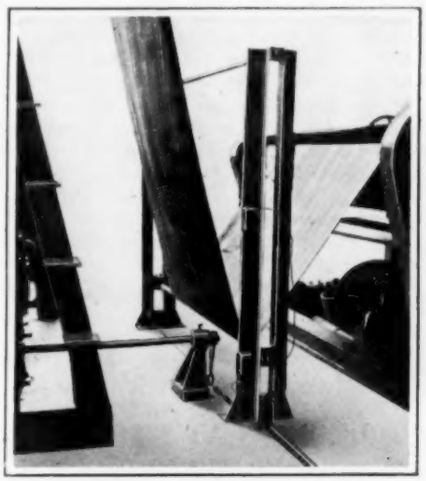
the effects of varying degrees of plasticity. It can also be used for grinding, massing, etc.

This model is patterned closely after the large production model and can be used for liquids and solutions as well as for water dispersions. It handles a four-pound batch of crude rubber and a somewhat larger quantity of 1.50 gravity mixed stock. It takes up about 10 square feet of floor space and requires a 7½ H. P. motor for operation.

Spadone Fabric Regulator

A NEW machine designed to regulate the feed of fabric from the lining stripper to the bias cutter has been developed by the Spadone Machine Company, Inc., 15 Park Row, New York City. It consists of a floating roll arranged between two uprights, which are fastened to the floor. The fabric passes under this roll, which is raised or lowered to a maximum or minimum position by the feed of the fabric. At two extreme points fastened to the uprights are limit switches, which are tripped by the roll, and control the starting and stopping of the lining stripper as the feed may demand. There is an additional mechanical device, arranged on one of the uprights, controlling the bias cutter and operated by the floating roll, which stops that machine in the event of the limit switch failing to function, and thereby preventing the possibility of serious mishap to the machine.

As the fabric is always under tension, the regulator considerably reduces its shrinkage between the lining stripper and bias cutter, and as the tendency is to feed in a straight line, it thereby causes greater accuracy of cut. It further prevents the possibility of damage to the bias cutter because of lack of sufficient feed of fabric, and eliminates necessity of constant watch of the lining stripper. The results of this equipment have been proved by thorough trial under actual operating conditions.



Spadone Fabric Regulator

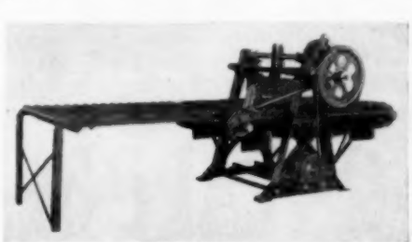
Royle Tuber Redesigned

Perfected Tuber No. 1, one of the pioneer tubing machines made by John Royle & Sons, Paterson, N. J., has recently been redesigned so as to meet modern needs, and is operated by worm instead of gear drive.

Stock Cutting Machine

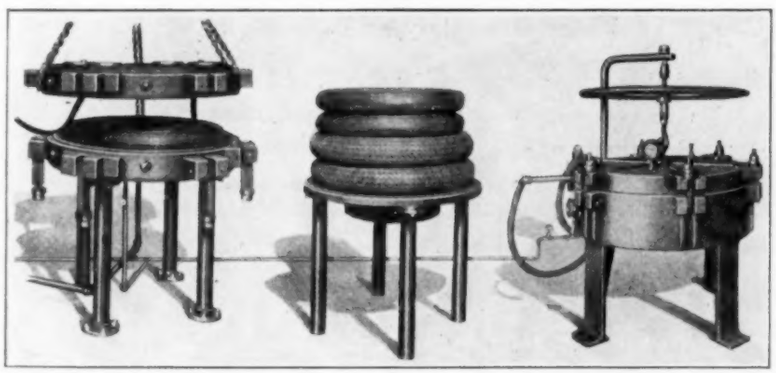
The Housatonic Machine and Tool Company, 19 Staples Street, Bridgeport, Conn., have announced the introduction of the "Weir" Automatic Rubber Stock Cutter, for cutting up into proper sizes for feeding tubing machines the slabs of rubber as they come off the mill. The manufacturers claim that one of these cutters will take care of the output of three or four mills with entire elimination of labor between the mills and the tubers. The machine is provided with a gravity belt conveyor at the front, forming a bench on which the rubber stock is placed. Another belt carries the batch to the knife, where it is cut into strips of from one to four inches. The width of the strip can be easily and instantly changed.

The knife blade is 28 inches wide. The carriage holding the knife employs a straight line motion, which is said to require less lubrication and less cleaning. The operation of this machine in conjunction with a battery of mills and tubers is said to effect a considerable saving in labor cost and in time.



Weir Rubber Stock Cutter

Franz Remolding Vulcanizers



Individual Remolder Table Remolding Press

TWO new vulcanizers suitable for use of tire repairmen have been introduced by the Franz Foundry & Machine Company, Akron, O. The accompanying illustration shows, from left to right, the individual remolder, table and the remolding press. The individual remolder is made in all sizes and can remold a tire from bead to bead in 35 to 45 minutes. A standard or special tread design can be used to suit the needs of the repairman. With this vulcanizer the steam pressure is carried constantly and it is not necessary to close the steam line when the tire is being removed.

To take care of a large range of sizes the Remolding Press is provided. In this vulcanizer a different shell is used for each size tire, the operation then being similar to the individual remolder. Time required to remove the shell and place the tire in the shell is only 3 to 5 minutes. It is claimed that by the use of this equipment remolded tires cannot be distinguished from new ones on account of the bead-to-bead cure.

DISTRIBUTION SCHEME FOR NEW PUBLICATION

In reply to many questions as to how interested parties may secure copies of "Rubber Chemistry and Technology," the new quarterly publication of the Rubber Division, American Chemical Society, Prof. H. E. Simmons, secretary-treasurer of the Division, has made the following explanation:

The regular subscription rate is $6.00 per year and anyone may become a subscriber at that price. The single copy price is $2.00. The principal distribution of the publication, however, is among members and associate members of the Division who receive copies without extra charge. Full membership in the Division is open only to members of the American Chemical Society; the Society dues are $15.00 per year and the Divisional dues an additional $2.00. Only rubber chemists are eligible for full membership in the Division. Associate membership is granted to those ineligible for full membership and the dues for that class are $4.00 per year.

Financial affairs of the new publication are in charge of Prof. Simmons who will be glad to receive subscriptions or inquiries concerning memberships. He can be addressed at Akron University, Akron, Ohio.

PRODUCTION AT FISK IS AT RECORD LEVEL

Unit output of the Fisk Rubber Company for the first quarter of the current year has been about 15 per cent greater than the production for the corresponding quarter of 1927. The present production rate is at a record high level, averaging 35,000 tires per day. The company's plant at Chicopee Falls, Mass., is producing 20,000 units daily while the plant at Cudahy, Wis., is averaging 15,000.

The company's inventor position is said to be especially favorable. The number of finished units on hand is 20 per cent lower than at the same time last year and commitments for crude rubber above the present market price are not believed to be large.

Edwin L. Stimson

Edwin L. Stimson, 53 years old, manager of the mechanical goods department of the Essex Rubber Company, Trenton, N. J., died at St. Francis Hospital, Trenton, on April 15 following an operation. He had been in ill health but a short time. The deceased resided at 87 Jefferson Road, Princeton, N. J. He leaves a widow, Alice E. Stimson, and one daughter, Miss Ruth S. Stimson. The burial was in the family plot in the Princeton Cemetery.

Mr. Stimson entered the service of the old Cleveland Rubber Company in 1893 and was affiliated with that concern for 26 years. The company is now the Cleveland works of the United States Rubber Company. Two years ago Mr. Stimson became the manager of the mechanical goods department of the Essex Rubber Company. He was widely known throughout the rubber trade.

Mansfield Host at Dinner

The Manfield Tire & Rubber Company, Mansfield, Ohio, was host to the City Foremens' Club recently at a banquet attended by over 250. Joel Daves, lecturer and author, was the principal speaker of the occasion and was followed by Fred G. Lange, of the safety and hygiene department of the Industrial Commission of Columbus, O., who talked of the present day position of the foremen in aiding the progress of safety methods.

Tire Size Program

The National Automobile Chamber of Commerce, which has been seeking the views of its members on a tire simplification program which has the approval of the Rubber Association of America and the Tire & Rim Association, was not ready, up to May 5, to render a complete report. Replies had been received from some members but pending a more complete vote on the adoption of the program, the Chamber will be unable to make an announcement. It is contemplated that other companies will be heard from shortly so that some statement can be made. The proposed program, which would cover automobile manufacturers' requirements for 1929, was published and discussed in the last issue of THE RUBBER AGE.

CATALPO!

IT PAYS TO MICRONIZE

BALANCED WEAR

NOTHING is quite so exasperating to the careful maker of quality rubber footwear as to find that the soles are outlasting the uppers.

This condition can be met and completely corrected by the inclusion in the upper stock of the requisite percentage of

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REG. U.S. PAT. OFF.

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The Philadelphia Rubber Works Company

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HELP WANTED

An Eastern Factory is desirous of obtaining an experienced man familiar with compounding, experimental, development and production work on Tires and Tubes. Address Box 483, THE RUBBER AGE.

Prominent Accelerator Manufacturer wishes to engage young chemist as assistant in compounding research laboratory. State experience and salary desired. Address Box 484, THE RUBBER AGE.

Calender Man—Experienced in operating calender for coating Clothing Fabrics and Hospital Sheetings. Address Box 481, THE RUBBER AGE.

EQUIPMENT FOR SALE

For Sale—By the Dayton Rubber Mfg. Co. Dayton, Ohio. One 54" Birmingham Calender, completely equipped, including 75 HP. direct current motor. In very satisfactory running condition. Reason for selling: changing to different method of operation. Has been in daily use. Price $2,000.00 f.o.b. Dayton, Ohio.

Adamson Mill—40 inch; bed plate; piping and valves. Also G. E. Motor, 15 H.P. with starting compensator and connections.
Box 486, THE RUBBER AGE.

One 62" Cameron Universal Type No. 6, Model C, slitter and rewinder, especially adapted for slitting and rewinding rubber, rubber fabrics, etc. Complete and in good condition for immediate delivery at reasonable price. Address Box 482, THE RUBBER AGE.

One Adamson 6" Tuber complete with bed plate, drive, 25 HP 440 volt, 3 phase, 60 cycle, 900 r.p.m. Lincoln Motor.
Box 480, THE RUBBER AGE.

MISCELLANEOUS

For Lease or Sale—Rubber factory; well equipped large mill room, 25,000 feet or more floor space; siding; low rental; near New York. Can be used for practically any type of rubber manufacture. Address Box 485, THE RUBBER AGE.

"DURO" BRAND

GUAYULE RUBBER

Washed and dry, ready for compounding. Invaluable in conjunction with Plantation Rubbers and Reclaims as an aid in Compounding.
Especially useful in all Friction Stocks.

CONTINENTAL RUBBER CO., OF NEW YORK

1775 BROADWAY NEW YORK CITY

LATE MARKET PRICES

Crude, Scrap & Reclaimed Rubber - Cottons and Fabrics

MAY 5, 1928

COTTON

AFTER a fortnight of steadily advancing prices in raw cotton the market slipped off sharply on May 3 on the strength of reports of better weather conditions in the cotton belt but the price levels are still well above those of two weeks ago. Coincident with the previous unfavorable weather reports and contributing to the advance in prices was an unexpected demand for May contracts, indicating that the mills have been holding back on forward purchases. The report on boll weevil emergence, scheduled for release on May 1, was withheld until emergence has taken place in sufficient amount to mean something. The carry-over of the last crop, which is now being made the subject of an congressional investigation, will be in the neighborhood of 5,500,000 bales.

High, low and closing prices as of May 3, were as follows:

	High	Low	Close	Close
	May 3		Apr. 18	
May	21.50	20.83	20.83	20.02
July	21.25	20.60	20.60	19.90
August	21.18	21.18	20.56	.....

Tire Fabrics

The market in tire fabrics has held strong during the past fortnight with prices slightly up and firm in response to the improved position of raw cotton. Sales have been light, however, and apparently confined to immediate requirements from the tire factories. Most of the tire companies' third quarter requirements are assumed to be closed. The Rubber Association of America reported approximately 22,564,000 pounds of cotton tire fabric consumed during February. Late quotations follow:

CORD			
Peeler, carded, 23/5/3	lb.	.45 @	.47
Peeler, carded, 23/4/3	lb.	.46½@	.48
Peeler, carded, 13/3/3	lb.	.43 @	.43½
Peeler, carded, 15/3/3	lb.	.44 @	.44½
Egyptian, carded, 23/5/3	lb.	.57 @	.59
Egyptian, combed, 23/5/3	lb.	.60 @	.62
CHAFERS			
Carded American, 8 oz.	lb.	.38 @	.39½
Carded, American, 10 oz.	lb.	.40 @	.41
Carded American, 12 oz.	lb.	.40 @	.42
Carded American, 14 oz.	lb.	.38½@	.43
LENO BREAKER			
Carded American, 8¼ oz.	lb.	.39 @	.42
Carded American, 10¼ oz.	lb.	.39 @	.42
SQUARE WOVEN			
Carded American, 17¼ oz. 23-11 ply	lb.	.45 @	.46
Carded American, 17¼ oz. 10-5 ply	lb.	.38½@	.39½

Sheetings

Price levels for various constructions of sheetings advanced in sympathy with the upward movement in raw cotton but sales have been extremely light over the period of the last two weeks. Latest prices are as follows:

40-inch, 2.50-yard	yd.	.12¼@	.12¾
40-inch, 2.85-yard	yd.	.11¼@	.11½
40-inch, 3.15-yard	yd.	.12 @	.12⅛
40-inch, 3.60-yard	yd.	.10 @	.10¼
40-inch, 3.75-yard	yd.	.08¾@	.09
40-inch, 4.25-yard	yd.	.07¾@	.08

Ducks

Price levels have risen in the cotton duck market and have been holding firm in spite of a reticence on the part of buyers to be reconciled to the higher quotations. Orders over the last fortnight have been of small size and for spot deliveries, apparently for only immediate needs. Late quotations follow:

Belting and Hose	lb.	.32½@	.33
Enameling	lb.	.33½@	.36
Shoe Ducks	lb.	.30 @	.33
Single filling	lb.	.14½@	.17
Double filling	lb.	.17½@	.18

RECLAIMED RUBBER

Prices in reclaimed rubber fell off during the last two weeks as a logical result of the continued low levels in the crude rubber market. Factories continue to report high schedules of production, however, and the demand for reclaim is still maintaining, indicating that rubber factories after having used reclaimed rubber for so long a time are loath to drop it now from their compounds.

High Tensile			
Super-Reclaim No. 1 Black	lb.	.14 @	.14¼
Super-Reclaim No. 2 Black	lb.	.11¾@	.12
High Tensile Red	lb.	.13¾@	.14
Shoe			
Unwashed	lb.	.07¼@	.07½
Washed	lb.	.10 @	.10¼
Tube			
No. 1 (Floating)	lb.	.14½@	.15
No. 2 (Compounded)	lb.	.11½@	.11¾
Tires			
Black, washed		.09½@	.10
Black, unwashed		.07¾@	.08
Black selected tires	lb.	.08¼@	.08½
Dark Gray	lb.	.10½@	.11
Light Gray	lb.	.12 @	.12½
White	lb.	.14 @	.14½
Truck, Heavy Gravity	lb.	.07¼@	.07½
Truck, Light Gravity	lb.	.07¾@	.08
Miscellaneous			
Mechanical Blends	lb.	.07 @	.08
Red	lb.	.13½@	.14

Scrap Rubber

The scrap rubber market is quiet with prices down in the chief grades and dealers complaining at the difficulties of accumulating stocks at the new low figures. The continued low price of crude rubber is causing considerable anxiety in scrap rubber circles and while the latest quotations are as listed below, prices both from the dealer and reclaimer must be regarded as nominal for the present, at least.

(Prices to Consumer)

Auto tire peelings	ton	30.00	@32.00
Standard White auto	ton	57.50	@60.00
Mixed auto	ton	25.00	@26.00
Bicycle tires	ton	28.00	@30.00
Clean solid truck tires	ton	22.00	@24.00
Boots and shoes	lb.	.01½@	.01¾
Arctics, trimmed	lb.	.01¼@	.01¼
Arctics, untrimmed	lb.	.01 @	.01¼
Inner tubes, No. 1	lb.	.07¼@	.07¾
Inner tubes, No. 2, compounded		.04¼@	.04½
Inner tubes, Red	lb.	.05¼@	.05½
Air Brake Hose	ton	38.00	@40.00
Rubber Hose	ton	18.00	@20.00

CRUDE RUBBER

THE crude rubber market has shown a surprising degree of firmness during the last fornight with very little fluctuations from the prevailing price level of 17¾ to 18 cents. Demand has been largely for spot deliveries with no special confidence manifested in future contracts at even the present low prices. The general feeling in trading circles seems to be that no sudden change can be expected and that present prices will prevail unless the statistical position of rubber is materially altered. At the present rate of consumption the stocks on hand and afloat to the United States are sufficient for five months' requirements. Stocks have declined in London and invoiced shipments to the United States show a decided decline. These two factors are, however, the only encouraging signs to the bull side of the market.

The prices on Para and off-grades are still nominal in the face of low priced first grade stocks. In view of the comparative long period that the factory interests have been out of the market the trading fraternity is looking for a renewal of buying within a short time. This opinion is helping to keep the market firm with offerings at stiffer prices.

Prices quoted on the New York outside market at the close of business on May 3, were as follows:

Plantations—		
Ribbed Smoked Sheets—		
Spot	.18 @	.18¼
May	.18 @	.18¼
June	.18¼@	.18½
July-Sept.	.18½@	.18¾
First Latex, crepe spot	.18¼@	.18½
Amber Crepe, No. 2	.17¼@	.17½
Amber Crepe, No. 3	.17 @	.17¼
Amber Crepe, No. 4	.16½@	.16¾
Brown Crepe, Rolled	.16 @	.16¼
Brown Crepe, Clean, thin	.16¾@	.17
Brown Crepe, specky	.16¼@	.16½
Liquid Latex, per gal.	@	1.50
Paras—		
Up-river Fine	.18½@	.18¾
Up-river Medium	Nominal	
Up-river Coarse	.15 @	.15¼
Acres Bolivian, fine	.18¾@	.19
Caucho Ball, Upper	.14½@	.14¾
Islands, fine	.16 @	.16½
Centrals—		
Central, scrap	.14¼@	.14½
Esmeraldas	.14¼@	.14½
Guayule, washed and dried	.20	
Balata—		
Block, Colombia	Nominal	
Block, Cuidad	Nominal	

LONDON MARKET

Standard Ribbed Smoked Sheets—Buyers		
Spot	8⅝@	8⅝d
May	8⅝@	8⅝d
June	8⅝@	8⅝d

SINGAPORE MARKET

Standard Ribbed Smoked Sheets—Sellers		
Spot	8¼@	8½d

We maintain ONE WAREHOUSE ONLY—All stocks under one roof—no branches. This lowers our overhead.

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Mills
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Whenever you are in need of good rubber equipment get our list of machinery first. We are sure to have just what you want at the lowest prices.

We also Buy and Sell Surplus Stocks of fabrics, liners, rubber, manufactured rubber products. Let us quote you on your overstocks.

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Heater Presses
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The Carrier Ejector System Dryer

The successful drying of Rubber is essentially a problem of humidity control. The patented Hunter Process is used exclusively in Carrier Dryers. Carrier automatically controlled dryers reduce time, space and milling costs.

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All Styles Rubber Aprons
Pure Rubber Sheets
Rubber Bibs
Crib Sheets
Bathing Caps
Rubber Specialties
Powder Puff Pockets
Randprint Rubber
SHEET GUM cut to pattern for manufacturers

"They Last Longer"

Made by
RAND RUBBER COMPANY, Inc.
Formerly Brooklyn Shield & Rubber Co., BROOKLYN, N. Y.

EMBOSSING CALENDERS

For Artificial Leather, Oil Cloth, Carriage and Automobile Covers

DRYING MACHINES

with Copper or tinned iron Cylinders for Cotton Ducks, Drills and Sheetings

The Textile-Finishing Machinery Co.
OFFICE, No. 83 EXCHANGE PLACE
PROVIDENCE, R. I.

Perfect Beads

Entire freedom from bead trouble in the construction of straight side tires is assured by the use of either National "(Patent)" High Tensile Strength, Flat Woven, Bead Braid on our new (Pratt Patent) Bead Cables. These cables, made to dimensions specified, have seven strands, yet only one piece of wire is used without soldered, welded or brazed joint.

Write for working samples of either National flat braid or Pratt cables (no charge to tire manufacturers) and full information as to our products and service.

Our engineering department tests beads and furnishes complete confidential reports as to their stretch, set and bursting point, without charge. Inquiries solicited regarding this special service.

National Standard Company
Niles, Michigan

Est. 1900 Inc. 1919

THE KUHKLE MACHINE CO.

Formerly Jones & Kuhlke

Automobile Tire Molds and Cores

GENERAL MACHINE WORK

Akron, Ohio

LATE RUBBER CHEMICAL PRICES

Accelerators — Colors — Softeners — Compounding Materials

NEW YORK, MAY 5, 1928

ACCELERATORS still hold the attention of the industry. Not only was DPG reduced in price shortly after the Supreme Court decision declaring the Weiss patent invalid, but the aldehydes and others have eased off somewhat and some brands are now quoted from 5 to 12 cents below previous prices. It is understood that several manufacturers of organic accelerators are watching developments very closely, but they have not yet reached any decision as to lower prices. In general, however, it is reported that there has been a slight easing off in demand for rubber compounding material in the past week. Tire factories are running almost at peak, except in the case of the smaller plants, with mechanicals and drug sundries just about holding their own.

ACCELERATORS

Organic			
A-7	lb.	.55 @	.59
A-11	lb.	.62 @	.66
A-16	lb.	.57 @	.61
A-19	lb.	.58 @	.62
A-20	lb.	.64 @	.68
Aero-X	lb.	.75 @	—
Aldehyde ammonia, crystals	lb.	.65 @	.70
Aniline oil, drums, f.o.b. works	lb.	.15 @	.16¼
Crylene	lb.	.55 @	.65
paste	lb.	.45 @	.55
Di-Ortho-Tolylguanidine	lb.	.48 @	.49
Diphenylguanidine	lb.	.40 @	.41
Ethylidene aniline	lb.	.60 @	.65
Formaldehyde Aniline	lb.	.36 @	.38
Grasselerator 102	lb.	.62½@	.67½
Grasselerator 552	lb.	4.45 @	4.60
Grasselerator 808	lb.	1.05 @	1.35
Grasselerator 833	lb.	1.50 @	1.75
Heptene	lb.	.45 @	.55
Hexamethylene-tetramine	lb.	.60 @	.65
Lithex	lb.	.18 @	.20
Methylenedianilide	lb.	.38 @	.40
Monex	lb.	3.25 @	—
Oynone	lb.	.68 @	.80
Para-Nitrosodimethylaniline, f.o.b. works	lb.	.92 @	.96
Piperidine-Piperidyldithio-Carbamate	lb.	4.45 @	4.60
R & H 40	lb.	.50 @	.55
R & H 50	lb.	.50 @	.55
Safex	lb.	1.20 @	1.25
Tensilac, No. 39	lb.	.55 @	.60
Tensilac, No. 41	lb.	.65 @	.70
Thermlo F	lb.	.50 @	.55
Thiocarbanilide, drums	lb.	.25½@	.26½
Thionex	lb.	3.25 @	—
Trimene	lb.	.75 @	—
base	lb.	1.20 @	—
Triphenylguanidine	lb.	.65 @	.70
Vulcanex	lb.	.65 @	—
Vulcone	lb.	.65 @	—
Vulcanol	lb.	1.05 @	1.08
Z 88	lb.	.65 @	.69
Inorganic			
Lead, sublimed blue	lb.	.08¼@	.08½
Lead, white	lb.	.10½@	.12½
Litharge, domestic	lb.	.09 @	.09¼
Magnesia, calcined,			
light	per 100 lb.	5.35 @	5.45
heavy	per 100 lb.	3.65 @	3.75
Waxene	lb.	.30 @	.32

COLORS

Blacks (See Compounding Materials)			
Blues			
Prussian	lb.	.33 @	.35
Ultramarine	lb.	.06 @	.30
Browns			
Sienna, Italian	lb.	.05 @	.12½
Umber, Turkey	lb.	.04½@	.07
Greens			
Chrome, light	lb.	.27 @	.31
medium	lb.	.29 @	.32
dark	lb.	.31 @	.34
Chromium Oxide, bbl.	lb.	.34 @	.36
Reds			
Antimony			
crimson, 15/17	lb.	.44 @	.50
sulphur free	lb.	.50 @	.55
golden 15/17 F.S.	lb.	.18 @	.22
Indian English	lb.	.08 @	.12
Domestic (Maroon)	lb.	.08 @	.12
Oximony	lb.	.13¼@	—
Red oxide, pure	lb.	.10 @	.12
Venetian red	lb.	.03 @	.06
Vermillion, quicksilver,			
English	lb.	1.85 @	1.95
Whites			
Lithophone, Akcolith	lb.	.05 3/5@	.06
Lithophone, Azolith	lb.	.05¼@	.05¾
Lithopone, Vanolith	lb.	.05¾@	—
Titanox	lb.	.10 @	.10½
Cal. Base Pigment	lb.	.10 @	.10½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06½@	.07
ZZ (leaded)	lb.	.06⅝@	.07⅛
Zinc Oxide—French Process			
White seal	lb.	.11⅞@	—
Green seal	lb.	.10⅞@	—
Red Seal		.09⅞@	—
Yellows			
Chrome	lb.	.15½@	.16½
Ocher, French medium	lb.	.03½@	.06
domestic	lb.	.01⅝@	.02

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85 @	24.50
Ammonia carbonate	lb.	.10½@	.12
Asbestine	ton	14.75 @	18.00
Barium carbonate	lb.	.03½@	.05
Barium Dust	lb.	.05 @	.06
Barytes southern off-color,	ton	12.00 @	18.00
Western prime white	ton	23.00 @	—
imported	ton	27.00 @	36.00
Basofor	lb.	.04½@	—
Blacks			
Arrow "Aerfloted"	lb.	.08 @	.12
Bone Black	lb.	.05½@	.11
Carbon, compressed	lb.	.07½@	.11½
Carbon, uncompressed	lb.	.07 @	.11
Drop Black	lb.	.06 @	.10
Lamp Black	lb.	.12 @	.40
Micronex	lb.	.08 @	.12
Velvetex carbon	lb.	.04 @	.07
Blanc fixe dry f.o.b. works	lb.	.04¼@	.04½
Carrara filler	lb.	.01¾@	.02
Catalpo (fact.)	lb.	.02 @	—
Chalk	ton	12.00 @	14.00
Clay, China, domestic	ton	8.00 @	9.00
Aerfloted Suprex	ton	9.00 @	20.00
Mineral Flour, c. l. fob mine	ton	20.00 @	23.00
Tensulite		15.00 @	—
Glues, extra white	lb.	.22 @	.26
medium white	lb.	.20 @	.24
Magnesia, carbonate	lb.	.08½@	.11
Mica, powdered	ton	65.00 @	80.00
Rotten Stone (powdered)	lb.	.02½@	.04½
Soapstone, powdered	ton	15.00 @	22.00
Starch, powdered	cwt.	3.30 @	3.70
Talc, domestic	ton	12.00 @	15.00
Velvetex	lb.	.04 @	.07
Whiting, commercial	cwt.	.85 @	1.00
English cliffstone	cwt.	1.50 @	—
Superfine	ton	10.00 @	12.00
Witco	ton	12.00 @	—
Wood pulp XXX	ton	45.00 @	—
Wood pulp X	ton	25.00 @	—
Zinc Carbonate	lb.	.09½@	.10½

MINERAL RUBBER

Genasco (factory)	ton	50.00 @	52.00
Montezuma, solid	ton	28.00 @	36.00
Montezuma, granulated	ton	32.00 @	42.00
Paradura	ton	62.50 @	65.00
Pioneer, MR, solid	ton	42.00 @	45.00
Pioneer-granulated	ton	52.00 @	55.00
Robertson, MR, solid	ton	34.00 @	80.00
M.R. (gran)	ton	38.00 @	80.00

SOFTENERS

Acids			
Nitric, 36 degrees	cwt.	5.00 @	5.25
Sulphuric, 60 degrees	ton	10.50 @	11.50
66 degrees	ton	15.00 @	16.00
Tartaric, crystals	lb.	.35 @	.36
Acids, Fatty			
Stearex	lb.	.10 @	.14
Stearic, double pressed	lb.	.11½@	.12½
Alkalies			
Caustic soda, 76%	cwt.	3.76 @	3.91
Soda ash, 58% C.L.	cwt.	1.40 @	
Oils			
Corn, refined, bbls.	lb.	.11 @	.11½
Cottonseed, crude		.08½@	.08¾
Cycline	gal.	.27 @	.34
Degras (c.l. 100 bbls.)	lb.	.03¾@	—
Less c. l. (10-25 bbls.)	lb.	.04 @	—
Lots less than 10 bbls.	lb.	.04¼@	.04½
Fluxrite	lb.	.05 @	.06
Hexalin	lb.	.60 @	—
Acetate	lb.	.70 @	—
Linseed, Raw C.L. bbl.	lb.	.09½@	.10
Palm Lagos	lb.	.07¼@	.07½
Niger	lb.	.07¾@	.08
Vansulol	lb.	.10½@	—
Para-Flux	gal.	.17 @	—
Peanut, domestic, crude	lb.	.12 @	.12¼
Petrolatum, white	lb.	08⅞@	.09
dark amber	lb.	.03⅝@	.03½
Pine, steam distilled	lb.	.70 @	
Rapeseed, refined	gal.	1.04 @	1.06
Rosin, grade K, 280 lb.	bbl.	9.65 @	—
second rectified	gal.	.58 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.06½@	.07½
coal tar	gal.	.05½@	.06
pine, 200 lb. gr. wt.	bbl.	9.00 @	10.00
Rosin, grade K, 280 lb.	bbl.	9.65 @	—
Pigmentar	gal.	.33 @	.41
Tar Retort, 50 gal.	bbl.	12.50 @	13.00
Solvents			
Acetone, pure	lb.	.13 @	
Alcohol denatured,			
No. 1 bbls.	gal.	.37½@	.44½
Benzol, 90%	gal.	.28 @	—
Carbon bisulphide	lb.	.05½@	.06¼
Carbon tetrachloride		.06¾@	.07½
Motor gasoline,			
steel bbls.	gal.	.17 @	—
Naptha, solvent	gal.	.35 @	.40
Turpentine, spirits	gal.	.60 @	.64
wood	gal.	.50 @	.54
Waxes			
Beeswax	lb.	.56 @	.58
Carnauba	lb.	@	.50
Ceresin, white	lb.	.10 @	.11
Montan, crude	lb.	.07 @	.07½
Ozokerite, black	lb.	.24 @	.25
green	lb.	.26 @	.30
Miscellaneous			
RSL Mold Solution	gal.	.75 @	.100

ANTI-OXIDANTS

Antox	lb.	.79 @	.83
Neozone	lb.	.74 @	—
Oxynone	lb.	.68 @	.80
Resistox	lb.	.54 @	.57
Stabilite	lb.	.65 @	—
VGB	lb.	.55 @	.66

SUBSTITUTES

Black	lb.	.08 @	.14
White	lb.	.10 @	.16
Brown	lb.	.08 @	.15

VULCANIZING INGREDIENTS

Sulphur Chloride (drums)	lb.	.03½@	.06
Sulphur flour,			
Superfine bags	cwt.	2.20 @	2.80
Superfine, bbls.	cwt.	2.55 @	3.10
100% pure, refined,			
bags	cwt.	2.60 @	3.15
bbls.	cwt.	2.95 @	3.50

TIRES & TUBES
CRUDE RUBBER

STATISTICAL SECTION

AUTOMOBILES
GASOLINE

THE official figures from the Department of Commerce covering March imports of crude rubber, showing that 36,926 tons were retained after deducting the re-exports, indicates that heavy arrivals are still coming into the country. Recent advices of rubber invoiced to the United States and now afloat, however, show a decided falling off, the report for the week of April 28 being the lowest for many months.

The daily quotations on ribbed smoked sheets show the gradual decline which prevailed in price levels during the fortnight, although within the last week prices have improved slightly from the record low of 17 cents on April 23. The second quarter of the present restriction year closed on April 30 and the average price for the period was 12.591 pence. As a consequence the exportable percentage allowable under the restriction act will remain unchanged at 60 per cent.

London stocks have been materially reduced and are at the lowest level they have been for over a year. Singapore stocks are also down, but these figures are no longer significant in view of the scrapping of restriction and the probability that the estates and native planters are beginning to pile up accumulations in anticipation of November 1.

Automobile production shows the March output to be the highest since May, 1927.

Latest figures covering imports and exports of rubber in the leading markets are included in this section.

PLAN OF THE SECTION

The statistics included in this section have been chosen for their constant importance to the rubber industry. The tables are reprinted in the same relative position in every issue, each table being kept current by the addition of new figures as soon as they become available. The section accordingly affords the most up-to-date, complete and convenient statistical service in the industry.

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U. S. Imports and Exports of Crude Rubber

	Gross Imports			Re-exports			Net Imports
YEARS	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons
1921	185,394	73,772,677	17.76	5,716	2,414,924	18.86	179,678
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,144	185,060,304	26.72	8,772	5,672,319	28.87	300,372
1924	328,056	174,231,331	23.71	10,309	6,057,637	26.23	317,747
1925	396,642	429,705,014	48.36	14,827	19,847,753	59.76	381,815
1926	413,338	505,817,307	54.63	17,671	22,470,583	56.77	395,667
1927	425,142	338,998,697	35.59	27,775	24,735,488	39.77	403,472
1926:							
Jan.	42,404	72,528,151	76.36	2,084	3,747,505	80.28	40,320
Feb.	32,865	58,738,370	79.78	1,430	2,280,168	71.17	31,435
Mar.	42,152	70,589,581	74.76	1,836	2,735,234	66.51	40,316
Apr.	34,544	48,742,539	62.99	1,128	1,605,093	63.58	33,416
May	29,756	36,896,080	55.35	1,052	1,558,987	66.17	28,704
June	24,900	34,498,561	61.85	1,105	1,371,217	55.41	23,795
July	35,820	33,061,470	41.20	1,554	1,743,854	50.09	34,266
Aug.	27,400	24,670,752	40.21	1,318	1,339,563	45.38	26,082
Sept.	37,112	32,625,032	39.02	1,437	1,519,870	47.20	35,675
Oct.	29,333	25,300,483	38.50	1,366	1,316,270	43.02	27,967
Nov.	38,925	34,661,631	39.97	1,482	1,320,461	42.00	37,443
Dec.	37,754	33,261,366	39.33	1,904	1,841,305	43.16	35,850
1927:							
Jan.	43,340	36,753,719	37.99	1,526	1,444,734	42.22	41,814
Feb.	28,338	23,110,257	36.41	2,451	2,277,297	41.47	25,887
Mar.	35,514	28,693,026	36.07	2,763	3,249,665	52.50	32,751
Apr.	46,202	37,284,806	36.15	1,575	1,428,425	40.45	44,627
May	36,543	30,998,657	37.87	2,782	2,501,562	41.74	33,761
June	33,045	27,833,770	36.28	1,775	1,550,592	38.99	31,270
July	37,678	31,678,259	37.53	1,958	1,560,853	35.58	35,720
Aug.	32,810	26,396,904	36.59	1,809	1,382,768	34.49	31,001
Sept.	33,301	23,852,857	33.73	3,500	3,036,929	34.91	29,801
Oct.	30,184	22,163,044	32.77	2,513	2,042,713	36.29	27,671
Nov.	38,113	27,039,129	31.67	2,468	2,014,196	36.43	36,123
Dec.	30,696	22,183,601	32.26	2,654	2,245,754	37.77	28,042
1928:							
Jan.	39,108	30,278,444	34.56	1,988	1,784,990	38.95	37,552
Feb.	33,094	27,309,598	36.84	2,738	2,229,589	36.34	30,356
Mar.	40,644	32,071,990	35.23	3,718	2,587,434	31.07	36,926
Apr.							
May							
June							
July							
Aug.							
Sept.							
Oct.							
Nov.							
Dec.							

*Official estimates based on arrivals at New York and Boston.

U. S. Consumption of Crude Rubber

(Rubber Association of America statistics raised to 100 per cent—All figures in long tons)

Figures on Monthly Basis

	1921	1922	1923	1924	1925	1926	1927	1928
Jan.	5,045	16,938	30,106	29,058	29,638	32,196	31,518	34,403
Feb.	5,955	14,767	30,149	25,736	29,761	31,136	30,137	33,702
Mar.	9,190	21,408	36,629	28,385	33,498	32,936	36,141	35,688
Apr.	13,084	19,294	29,085	27,129	34,139	32,696	35,871	
May	16,023	23,246	36,155	25,845	35,322	29,364	34,592	
June	16,142	31,713	24,272	22,753	35,822	28,598	33,801	
July	18,310	24,522	17,685	23,396	36,053	27,577	29,219	
Aug.	23,649	29,361	20,359	28,982	35,909	34,533	33,460	
Sept.	16,705	24,410	17,594	31,497	31,691	32,904	27,214	
Oct.	16,814	26,881	21,321	31,520	29,047	29,836	26,790	
Nov.	14,105	24,950	20,437	27,289	28,853	28,080	26,792	
Dec.	15,482	25,070	21,902	27,199	28,748	26,293	25,492	
Totals	170,504	282,560	305,694	328,769	388,481	366,149	371,027	

Figures on Quarterly Basis

Quarter	1921	1922	1923	1924	1925	1926	1927
Jan./Mar.			96,776	87,609	95,263	94,301	99,216
Apr./June	65,463	127,360	89,493	75,674	104,099	87,109	103,243
July/Sept.			55,621	83,813	99,493	93,793	89,210
Oct./Dec.	105,962	155,067	63,617	92,656	85,789	83,212	80,860
Totals	171,425	282,427	305,507	339,752	384,644	358,415	372,528

Note—The Rubber Association estimates its monthly rubber consumption figures to be 90 per cent complete. Up until 1925 the quarterly figures were likewise estimated to be 90 per cent complete; beginning with 1925 an estimate of 92 per cent completeness has been used. These estimates have been used in raising the figures in this table to 100 per cent. The quarterly figures are generally regarded as the most authentic; the monthly figures may be accepted as preliminary.

Rubber Invoiced to the U. S.

(Reported by American Consuls—Quantities in Long Tons)

During the Week Ended	From Br. Malaya	From Ceylon	From Dutch East Indies	From London & Liverpool	Total
February 25	6,147	613	1,664	240	8,664
March 3	3,865	618	1,576	1,756	7,815
March 10	4,789	685	1,376	1,951	8,801
March 17	3,981	487	1,463	1,856	7,787
March 24	4,253	409	1,266	2,323	8,251
March 31	2,652	528	1,028	776	4,984
April 7	3,061	718	1,381	882	6,042
April 14	3,097	606	1,585	209	5,497
April 21	4,190	42	1,215	2,535	7,982
April 28	2,498	484	895	739	4,616

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1925																																
August	94½	—	95½	88¾	85¾	86¾	81¾	79	—	71¾	72½	76½	81½	80¾	77¾	82½	78¾	80½	80¾	83½	82½	82½	83½	82½	85¼	85¼	87¼	85¼	—	91¼	83
September	88¾	87¼	85	81¾	81¼	—	80½	78¼	80½	83	—	86½	92	—	93½	98¾	93½	94¼	—	—	92	93½	93½	90	89	89	89¾	91¾	89	90	88⅝
October	91¾	91¼	—	94½	—	—	—	—	99¼	101	—	—	92½	—	93½	99¼	98¾	92	99	101¼	102	99¼	99¾	99¾	98	98	99¾	101½	99¼	91½	100¼	95
November	—	99¾	—	98¾	98¾	100	—	87	98¾	99½	100¼	101¾	104½	105½	—	99¾	97	96½	99	107	109¾	110¾	110½	109	106¼	—	105¾	108¾	107	91¼	91¼	104¾
December	106¾	108½	107¾	107¾	108¾	—	108	109	109¾	106	105½	105½	—	101	—	90¾	93	88¼	86¾	—	88¼	88¾	88¾	88¾	—	—	—	91	93	—	—	98½
1926																																
January		—	—	87	87¼	85½	86½	87¾	87¾	—	88½	88¼	83¾	85½	84½	82½	75½	73½	75½	76	72½	72½	68	67	68	67	69¾	70½	69	—	79½
February		67	67½	66¾	66¾	69	—	69	67	65	66	66	65½	63	63	60½	59	60	61	—	66	56	62	61	62	61¾	61	—	—	—	—	62¾
March		58	58	53	53½	57¼	—	56	55½	61	60	63	61½	62	60½	62	61	61	61	61½	61	61½	60	60	59½	60	59	59¾	60	88½	88	61¼
April		59	—	59	59	58	56½	56½	53	53	49½	51½	60½	62½	62	60½	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62	62
May		48½	—	50	50¼	49¼	49¾	49¾	49	49	49¼	49	49¼	49¼	47¾	47¾	47¾	47½	47½	47½	47½	48	48	48½	48	48	48	48	48	48	48	47¾
June		41½	41¼	42	42	41¾	42	41¾	41¾	42	42	42	42	42	42	42	42	42	42	42	42	46	46	46	46	46	46	46	46	46	46	42½
July		42	42	42	42	41¾	41¾	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½
August		38¾	38½	37	37	39¼	39¼	41½	38¾	37¾	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	39½	39½	39½	39½	39½	39½	39½	39½	39½	39½	39½
September		40¼	40¼	40	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40½	40½	40½	40½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½
October		43	43	43¼	42¾	42¾	42¾	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½	42½
November		41¼	41	41¼	41½	41½	41½	41½	41½	42½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½	41½
December		36¾	37½	37½	37½	37	—	37	37	37	37	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½
1927																																
January		—	—	88½	89¼	89¼	89¼	89¼	—	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾
February		87½	87½	87½	87½	87½	87½	87½	—	38	37¾	41½	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾	41¾
March		89¾	89¾	40	40¼	40¼	40¼	40¼	40¼	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾
April		41¼	41¼	41	41	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼	41¼
May		40¼	40½	40¾	41	41	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾	40¾
June		40%	40¼	40¼	39½	39½	39½	39½	39½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½	37½
July		85½	85½	85¼	84½	84½	84¾	84¾	84¾	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½	84½
August		85¼	85¼	85¼	85½	85½	85½	85½	85½	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾	85¾
Sept.		34	33¾	—	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾	33¾
Oct.		33	33	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼	33¼
Nov.		35½	35½	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼	35¼
Dec.		40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼	40¼
1928																																
January		—	—	41¼	41¼	41¼	41¼	41¼	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
February		87½	87¾	87¾	87¾	87¾	—	87¾	87¾	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
March		29	28⅝	28⅞	27½	21¼	21¼	—	—	29	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾	25¾
April		—	27¼	27½	27½	21¼	21¼	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May		17½	17½	18¼	19¾	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1910-1921

Year	Cents	Year	Cents	Year	Cents
1910	206.60	1914	65.33	1918	60.15
1911	141.30	1915	65.85	1919	48.70
1912	121.60	1916	72.50	1920	36.30
1913	82.04	1917	72.23	1921	16.36

Average Monthly Price per Pound Since 1922

Months	1922 Cents	1923 Cents	1924 Cents	1925 Cents	1926 Cents	1927 Cents	1928 Cents
Jan.	18.82	32.73	25.86	36.71	79.50	38.75	40.25
Feb.	16.12	35.14	25.29	36.01	62.25	38.25	32.75
Mar.	14.53	34.21	22.83	41.00	59.00	41.04	26.82
Apr.	15.99	32.48	22.51	43.64	51.25	40.86	18.97
May	15.25	27.39	18.89	58.47	47.75	40.76	
June	15.11	26.88	18.81	77.26	42.50	37.25	
July	14.67	26.10	22.16	103.16	41.03	34.44	
Aug.	13.93	28.84	26.17	82.99	38.50	35.12	
Sept.	14.44	28.95	27.56	88.88	41.00	33.67	
Oct.	19.78	26.93	31.13	98.01	42.50	34.32	
Nov.	23.88	27.14	34.33	104.80	38.50	37.58	
Dec.	27.42	26.60	37.88	98.51	38.25	40.63	
Average for Year	17.50	29.45	26.20	72.46	48.50	37.72	

London Closing Prices of Ribbed Smoked Sheet

(In Pence Per Pound)

Sixth Restriction Year—Second Quarter

Day	Feb.	Mar.	Apr.	Day	Feb.	Mar.	Apr.
1	18⅝	13⅞	—	17	15⅝	12¼	8
2	17¾	13⅝	12⅞	18	15¼	—	8
3	18	13¾	12⅞	19	—	13⅛	8⅛
4	17⅞	—	10¼	20	14⅜	13	8⅛
5	—	13⅝	9½	21	14⅜	12¾	8⅛
6	17¾	13½	—	22	14⅜	13	—
7	17¾	12⅝	—	23	14⅝	13⅛	7⅞
8	17⅞	12⅛	—	24	13¾	13¼	8
9	16¼	12¼	—	25	13¾	—	8
10	16½	12½	8¾	26	—	13	8¼
11	16⅝	—	8⅝	27	14	13⅛	8¼
12	—	11¾	8¾	28	14⅛	13⅛	8⅜
13	15⅞	11½	8⅝	29	13⅞	13¼	—
14	15⅜	11⅝	8⅝	30	—	13⅛	8¼
15	15⅝	11⅜	—	31	—	13	—
16	15½	12⅛	8⅝				

(The average price for the period for which daily prices are reported above is approximately 12.591 pence. The British Colonial Secretary has announced that only 60% of the standard production will be exportable from the restricted area during the next quarter if the price during the entire current quarter does not average at least 21 pence.)

Average Price in Previous Quarters

Quarter	1922-23	1923-24	1924-25	1925-26	1926-27	1927-28
Nov.-Jan.	14.285	14.175	17.9983	46.709	19.265	19.023
Feb.-Apr.	16.858	12.917	19.356	28.103	19.696	
May-July	14.242	10.947	38.469	21.001	18.165	
Aug.-Oct.	14.944	14.632	43.269	20.199	16.620	

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Day of Month	Apr. Cents	May Cents	Day of Month	Apr. Cents	May Cents	Day of Month	Apr. Cents	May Cents
1	——	22.30	11	20.20	——	21	20.60	——
2	19.95	22.00	12	20.20	——	22	——	——
3	19.80	21.35	13	20.45	——	23	20.65	——
4	19.85	21.35	14	20.50	——	24	20.90	——
5	18.95	——	14	——	——	25	21.30	——
6	——	——	16	20.35	——	26	21.60	——
7	——	——	17	20.55	——	27	21.85	——
8	——	——	18	20.50	——	28	21.75	——
9	20.30	——	19	20.50	——	29	——	——
10	20.10	——	20	20.45	——	30	22.15	——
						31	——	——

Average Monthly Price Per Pound

Month	1926 Cents	1927 Cents	1928 Cents	Month	1926 Cents	1927 Cents	1928 Cents
Jan.	20.85	13.42	19.12	Aug.	18.57	20.04	
Feb.	20.60	14.10	18.40	Sept.	17.02	21.95	
Mar.	19.35	14.32	19.38	Oct.	13.14	20.55	
Apr.	19.13	14.75	20.63	Nov.	12.86	20.22	
May	18.92	16.07		Dec.	12.68	19.58	
June	18.57	16.85		Average for Year	17.53	17.49	
July	18.71	18.00					

Stock of Crude Rubber in the U. S.

(All Quantities in Long Tons)

At End of	ON HAND			AFLOAT			ON HAND AND AFLOAT		
	1926	1927	1928	1926	1927	1928	1926	1927	1928
Jan.	55,198	76,172	110,244	46,296	45,312	41,256	100,434	121,484	151,500
Feb.	58,035	91,186	108,955	46,935	42,166	43,316	104,970	133,352	152,271
March	61,822	85,740	114,061	43,567	49,600	39,324	105,389	135,340	153,385
April	55,261	92,757		41,905	38,963		97,166	131,720	
May	64,360	94,563		40,303	44,181		104,663	138,744	
June	60,460	89,250		40,907	47,233		101,367	136,483	
July	64,900	98,469		38,062	40,587		102,962	139,056	
Aug.	60,870	96,148		37,360	40,937		98,230	137,085	
Sept.	62,078	97,829		42,464	37,966		105,542	135,795	
Oct.	64,089	97,452		52,930	42,804		117,919	140,256	
Nov.	69,385	101,034		47,311	37,076		116,696	138,110	
Dec.	72,520	100,180		52,020	47,938		124,540	148,068	

(Rubber Association of America figures raised to 100%.)

Stock of Crude Rubber in London

(No. of tons in Wharves and Warehouses, including Latex)

At end of:	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	19,300	56,573	67,252	73,498	57,460	27,172	9,994	54,994
Feb.	18,329	59,439	67,628	70,483	56,732	23,425	10,004	58,826
Mar.	18,969	63,913	66,670	63,438	55,647	18,104	13,127	63,055
Apr.	20,072	68,759	68,637	58,770	54,559	12,949	18,773	66,897
May	20,921	70,403	70,146	54,439	51,615	5,895	20,384	67,169
June	22,517	69,408	71,597	51,050	51,115	5,318	23,984	68,902
July	25,346	71,065	71,515	49,937	52,073	4,258	27,727	63,717
Aug.	30,674	73,211	72,112	58,427	49,700	4,619	30,165	64,491
Sept.	35,504	72,175	70,977	54,523	44,011	5,453	35,077	68,236
Oct.	41,743	69,229	68,536	58,891	37,523	5,086	42,138	69,569
Nov.	45,550	70,786	68,548	60,074	33,593	3,869	44,057	67,050
Dec.	50,652	69,792	72,299	60,246	29,488	5,697	48,918	63,793

At End of Recent Weeks

	First Saturday	Second Saturday	Third Saturday	Fourth Saturday	Fifth Saturday
1927					
July	63,917	64,163	63,511	62,819	63,626
August	64,177	64,557	64,842	64,259	
September	65,162	66,148	66,664	67,253	
October	68,519	70,167	70,916	70,060	69,551
November	69,660	69,501	69,850	67,318	
December	65,869	66,011	64,761	63,397	63,207
1928					
January	64,360	65,524	65,450	66,285	
February	65,909	64,945	63,769	63,103	
March	61,978	61,920	61,033	59,644	58,197
April	58,732	58,945	56,819	53,360	
May					
June					

Rubber in Singapore and Penang

(Stocks held by Dealers—Quantities in Long Tons)

End of	1926	1927	1928	End of	1926	1927	1928
Jan.	16,726	25,440	25,868	July	23,101	22,558	
Feb.	13,653	26,766	22,867	Aug.	23,362	25,764	
Mar.	18,389	27,844	20,538	Sept.	25,997	25,178	
Apr.	16,328	24,543		Oct.	26,614	25,790	
May	16,967	25,133		Nov.	25,486	28,369	
June	19,416	21,898		Dec.	26,443	25,798	

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total	Per Cent Balloons		Total	Per Cent Balloons
1922	16,297,735	0.0	1925	26,001,664	66.8
1923	23,140,620	0.6	1926	24,199,524	78.8
1924	21,863,311	19.7	1927	19,700,003	79.1
1927			1928		
July	1,679,587	84.4	January	1,811,534	87.8
August	1,825,905	80.2	February	1,806,437	86.5
September	1,727,122	77.7	March	2,420,084	86.4
October	1,354,924	81.4	April		
November	838,591	67.8	May		
December	1,134,421	80.0	June		

U. S. Consumption of Gasoline

(In Barrels of 42 Gallons)

MONTHS	1924	1925	1926	1927	1928
January	11,918,000	14,386,000	17,582,000	17,888,000	20,939,000
February	9,626,000	13,210,000	15,814,000	18,240,000	21,136,000
March	10,961,000	14,890,000	19,302,000	22,464,000	24,041,000
April	14,583,000	19,013,000	20,848,000	23,371,000	
May	15,889,000	20,459,000	24,213,000	26,579,000	
June	16,421,000	20,724,000	23,803,000	27,799,000	
July	18,610,000	22,879,000	24,752,000	29,784,000	
August	19,825,000	22,323,000	26,912,000	29,779,000	
September	16,871,000	20,177,000	22,929,000	28,409,000	
October	18,029,000	19,826,000	23,973,000	25,497,000	
November	16,607,000	18,024,000	20,618,000	24,400,000	
December	15,663,000	17,954,000	21,419,000	23,718,000	
TOTAL	185,003,000	223,865,000	262,165,000	297,928,000	

U. S. Tire and Tube Statistics

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Figures for Recent Years

	1922	1923	1924	1925	1926	1927
Production	40,932	45,259	51,633	60,845	61,237	64,439
Shipments	39,987	45,204	50,120	59,262	59,092	64,059
Inventory[2]	6,132	5,772	7,427	8,142	10,456	10,264

Figures for Recent Months

	PRODUCTION			SHIPMENTS			INVENTORY		
	1926	1927	1928	1926	1927	1928	1926	1927	1928
Jan.	4,587	4,965	5,491	2,974	4,932	5,394	9,947	10,432	9,949
Feb.	4,865	5,095	6,363	3,436	4,458	5,031	11,164	11,075	11,721
Mar.	5,456	6,276		4,561	5,701		12,004	11,583	
Apr.	5,346	6,299		4,980	5,701		12,461	12,122	
May	5,023	6,151		5,211	5,657		12,343	12,462	
June	5,422	6,202		5,724	6,253		11,968	12,462	
July	4,950	5,087		6,337	5,973		10,592	11,326	
Aug.	5,872	5,752		6,744	6,393		9,732	10,721	
Sept.	5,706	4,822		6,040	5,717		9,318	9,722	
Oct.	5,103	4,773		4,544	4,799		9,917	9,665	
Nov.	4,324	4,502		3,733	4,306		10,297	10,136	
Dec.	4,683	4,497		4,718	4,165		10,456	10,264	

AUTOMOBILE INNER TUBES

Figures for Recent Years

	1922	1923	1924	1925	1926	1927
Production	50,850	60,116	70,706	82,614	76,618	70,823
Shipments	49,673	59,072	68,016	81,004	71,591	72,896
Inventory[2]	7,643	8,425	11,052	11,313	16,200	13,692

Figures for Recent Months

	PRODUCTION			SHIPMENTS			INVENTORY		
	1926	1927	1928	1926	1927	1928	1926	1927	1928
Jan.	6,809	5,337	5,441	3,723	6,016	6,072	14,361	15,585	12,982
Feb.	6,825	5,658	6,895	3,736	5,120	5,431	17,090	16,075	14,650
Mar.	7,030	7,184		4,987	6,157		19,131	17,096	
Apr.	6,554	7,373		5,051	6,359		20,674	17,801	
May	6,149	6,737		6,304	6,140		21,141	18,389	
June	6,171	6,306		6,898	6,832		20,245	17,858	
July	5,729	5,284		8,569	7,070		17,267	16,004	
Aug.	7,424	6,480		9,579	7,983		15,462	14,664	
Sept.	7,590	5,651		7,762	6,758		15,312	13,511	
Oct.	6,208	5,065		5,474	5,024		15,929	13,539	
Nov.	4,852	4,775		4,045	4,723		16,604	13,585	
Dec.	5,277	4,969		5,463	4,712		16,200	13,692	

(1) Rubber Association of America figures, raised to 100%. The Association estimates its figures to be 75% representative or complete when issued and that basis has been accepted when preparing the statistics in this table.

(2) Held by manufacturers at end of period indicated.

Automobile Production

	United States			Canada			
	Total	Passenger Cars	Trucks	Total	Passenger Cars	Trucks	Grand Total
1921	1,595,304	1,452,902	142,402	66,246	61,098	5,148	1,661,550
1922	2,547,208	2,302,923	244,285	102,053	94,904	7,149	2,649,261
1923	4,020,255	3,631,728	388,527	146,438	129,228	17,210	4,166,693
1924	3,600,918	3,203,049	397,869	135,246	117,765	17,481	3,736,164
1925	4,265,704	3,760,459	505,245	161,389	139,311	22,078	4,427,093
1926	4,298,799	3,808,753	490,046	205,092	164,483	40,609	4,503,891
1927							
Jan.	238,926	199,650	39,276	15,376	11,745	3,631	254,302
Feb.	304,758	264,171	40,587	18,655	14,826	3,829	323,413
March	394,430	345,911	48,519	23,250	19,723	3,527	417,680
April	404,743	357,009	47,734	24,611	20,890	3,721	429,354
May	404,099	357,148	46,951	25,708	21,991	3,717	429,807
June	321,959	278,728	43,231	19,208	16,470	2,738	341,167
July	268,474	236,866	31,608	10,987	8,719	2,268	279,461
Aug.	308,807	274,378	34,429	12,526	10,139	2,387	321,333
Sept.	260,420	226,440	33,980	11,262	8,681	2,581	271,682
Oct.	219,712	183,041	36,671	7,791	6,236	1,555	227,503
Nov.	134,381	109,742	24,639	6,617	5,173	1,444	140,998
Dec.	133,178	105,784	27,394	3,435	2,277	1,158	136,613
TOTAL	3,393,887	2,938,868	453,019	179,426	146,870	32,556	3,573,313
1928							
Jan.	225,039	199,032	26,007	8,463	6,705	1,758	233,502
Feb.	323,368	290,830	32,358	12,504	10,315	2,189	335,872
March	412,825	371,408	41,417	9,724	7,478	2,246	422,549
April							
May							
June							
July							
Aug.							
Sept.							
Oct.							
Nov.							
Dec.							

Exports of Crude Rubber from Principal Producing Countries

(*Long Tons*)

	BRITISH MALAYA[1]								DUTCH EAST INDIES[2]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon[3]	India & Burma[3]	Sarawak[4]	British North Borneo[4]	Siam[4]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China[3]	Amazon Valley	All Other[5]	World Total[7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,955
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	517,523
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1926:															
Jan.	30,452	10,237	20,215	4,246	1,273	416	472	289	4,110	6,239	8,165	866	1,284	1,805	49,380
Feb.	30,440	8,306	22,134	5,120	725	488	450	253	4,524	5,717	6,854	554	2,759	1,978	51,556
Mar.	35,012	14,800	20,212	5,177	1,113	792	561	418	4,527	5,566	11,984	573	2,126	1,899	54,948
Apr.	23,727	10,565	13,162	3,766	590	679	374	293	4,226	4,598	6,285	410	2,318	1,529	38,230
May	31,231	10,604	20,627	3,944	691	927	410	279	4,440	5,358	8,737	502	1,353	1,464	48,732
June	30,624	11,764	18,860	4,208	452	770	512	275	4,444	6,125	10,614	549	1,213	1,279	49,310
July	28,824	15,280	13,544	4,422	938	911	498	439	4,618	5,612	13,112	1,521	1,565	1,148	48,328
Aug.	34,625	13,595	21,030	5,666	521	890	476	316	4,132	5,699	10,390	378	1,888	1,097	52,483
Sept.	35,913	13,972	21,941	6,015	651	888	689	457	4,065	6,568	11,391	681	2,156	822	56,824
Oct.	39,367	15,203	24,164	5,672	634	805	473	385	4,058	6,998	11,491	661	1,904	1,023	58,268
Nov.	34,302	12,201	22,101	4,228	1,110	685	547	285	3,988	5,816	9,422	718	1,911	1,259	52,070
Dec.	36,811	14,716	22,095	6,498	1,176	895	617	338	5,054	7,117	12,786	790	3,821	714	61,901
1927:															
Jan.	34,946	14,995	19,951	6,697	921	959	585	304	4,187	6,706	10,690	941	3,482	981	56,404
Feb.	27,528	11,697	15,831	3,571	1,469	552	445	360	4,078	6,526	10,535	675	2,104	1,098	47,244
Mar.	41,346	17,464	23,882	7,142	1,124	997	639	432	5,657	7,004	12,905	733	3,178	1,791	65,484
Apr.	29,041	13,069	15,972	3,349	723	984	452	526	4,666	5,531	10,197	557	2,451	1,520	46,928
May	31,393	15,491	15,902	3,124	760	786	415	348	5,430	5,529	13,410	586	2,460	1,207	49,957
June	32,607	14,706	17,901	3,348	856	1,100	539	409	4,818	5,518	9,109	772	889	1,731	46,990
July	23,947	12,697	11,250	4,018	827	859	544	333	4,771	6,142	11,566	519	1,757	1,113	43,699
Aug.	30,371	17,105	13,266	5,357	688	1,133	623	546	4,355	6,682	12,440	716	1,928	969	48,703
Sept.	29,835	12,095	17,740	4,911	479	645	566	498	3,635	5,957	9,853	497	2,072	1,213	48,066
Oct.	29,846	15,801	14,045	5,245	802	721	591	542	3,810	7,755	13,633	775	2,752	939	51,520
Nov.	28,277	19,860	8,417	4,464	1,277	1,241	591	600	4,127	6,587	14,395	683	2,369	1,627	46,378
Dec.	32,185	17,865	14,320	4,130	1,395	946	592	664	5,763	7,878	13,438	1,191	3,340	1,444	55,101
1928:															
Jan.	27,731	16,618	11,113	4,352	1,605	842	500*	525	4,851	7,988	11,360	720	2,273	1,200*	47,329*
Feb.	28,813	12,911	15,902	4,353	1,081	667	500*	536	4,052	6,757	8,635	723	1,612	1,200*	46,018*
Mar.	27,813	10,508	17,305	3,460		645	500*	269	3,999	5,826	9,690	613	2,750		

(1) Mayalan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, and 3,263 in 1926. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons 1924, 6 tons 1925, and about 20 tons in 1926. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons 1924, 2,239 tons 1925, and about 60 tons in 1926. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Italy, Belgium and Netherlands. This figure includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. *Figure is provisional; final figure will be shown immediately it becomes available.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(*Long Tons*)

	United States[a]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (ac)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	236,977	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	342,378
1920	248,762	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	370,641
1921	179,678	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,562
1922	296,267	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	-3,807	1,778	589	567	395,885
1923	300,372	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	408,018
1924	317,747	-11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	-807	3,178	944	1,370	414,847
1925	381,815	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	516,493
1926	395,667	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	613,643
1926:															
January	40,345	6,886	2,832	703	2,188	892	760	332	438	76	163	303	89	134	56,141
February	31,435	3,114	3,063	1,113	1,865	741	1,041	643	512	143	88	397	145	75	44,375
March	40,316	3,907	3,941	1,342	2,079	864	1,037	832	547	129	227	377	109	161	60,868
April	33,416	3,275	4,121	1,781	1,615	1,868	865	402	505	71	93	335	130	193	53,670
May	28,705	6,773	2,519	1,848	1,239	1,010	705	200	468	186	241	225	60	192	44,371
June	28,795	5,894	2,196	1,655	1,188	1,465	1,070	983	636	269	215	303	123	103	39,895
July	34,266	6,768	2,352	2,202	1,552	1,447	800	132	702	295	480	292	121	115	51,524
August	26,081	7,327	2,457	2,110	1,888	1,284	796	655	1,275	303	594	336	90	151	45,347
September	35,675	8,843	1,774	2,029	1,355	1,922	819	472	1,241	283	429	317	91	138	55,388
October	23,110	8,082	3,376	2,423	1,865	2,396	645	585	1,004	301	2	360	100	121	49,370
November	37,673	9,247	2,719	3,007	1,548	3,380	832	568	916	194	-18	358	90	181	60,695
December	35,850	4,749	2,890	2,562	1,847	856	439	725	777	248	156	443	151	306	51,999
1927:															
January	41,815	10,192	3,284	2,481	1,936	1,227	672	803	929	296	192	316	139	100	64,382
February	25,886	7,692	3,263	3,103	2,620	1,902	601	907	460	502	152	336	146	210	47,780
March	32,752	9,049	2,050	3,475	3,760	1,578	852	784	780	454	86	385	137	127	56,269
April	44,627	7,875	2,310	2,393	1,509	2,181	781	1,972	762	448	58	280	177	218	65,541
May	33,736	2,896	2,006	3,380	2,519	1,084	918	887	694	626	-57	335	155	223	49,402
June	31,270	2,282	2,387	3,632	2,086	798	942	1,506	557	583	-17	243	164	183	46,616
July	35,719	1,116	2,384	2,899	2,104	1,505	1,007	415	900	429	66	227	177	236	49,184
August	31,001	3,463	2,795	3,119	2,013	1,970	1,274	386	650	604	-63	312	138	123	47,785
September	29,801	7,800	1,956	2,891	1,850	2,025	684	518	772	552	-33	451	155	272	49,694
October	27,671	5,888	3,479	4,202	1,790	1,966	1,021	1,075	908	465	156	401	153	363	49,538
November	36,123	1,687	3,661	4,209	1,916	1,575	1,167	1,312	836	749	298	474	246	317	54,570
December	28,082	309	4,696	3,108	2,302	2,710	1,462	1,453	1,242	784	-202	514	268	300	47,028
	398,483	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,492	636	4,224	2,055	2,672	627,789
1928:															
Jan.	37,552	1,921	1,764	2,485	2,290	1,361	546	572	802	589	52	261	335	376	50,906
Feb.	30,926	3,143	2,526	2,984	2,553	1,258			616	599	98	307		297	
Mar.	36,970	3,179		3,521							95				

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—United Kingdom exports to Russia, and beginning with October, 1927, exports from the United States to Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. *United States imports of guayule are not included in this compilation: such imports amounted to 4,305 tons in 1926 and to 5,019 tons in 1927.

BOOK REVIEWS

THIRTY YEARS OF GOODYEAR, 1898-1928. A statement to the Stockholders of the Goodyear Tire & Rubber Company. By P. W. Litchfield. President. 1928. 16 pp.

This small booklet is a historical sketch of the Goodyear company from its infancy to the present time and is by the chief executive of the organization and a man who has spent 28 years in the company's service. Included in the pages are brief biographies of the company's directors and statistical tables indicating the growth of the organization and the financial position of the company year by year. A world map showing the location of Goodyear's operations is also included.

FIFTEENTH ANNIVERSARY BLUE BOOK, 1913-1928. National Association of Waste Material Dealers, Inc., March, 1928. Price $5.00. New York, N. Y. 342 pp.

This annual publication reviews the history and purposes of the National Association of Waste Material Dealers and contains a complete list of all members, classified by various groups. The section most interesting to the rubber industry is devoted to the scrap rubber group, and contains the detailed specifications of the numerous commercial grades of rubber scrap and the requirements for making scrap tire shipments, besides a list of domestic and foreign scrap rubber dealers. The volume constitutes a necessary reference book covering the scrap rubber field.

ALPHABETICAL INDEX AND NUMERICAL LIST OF UNITED STATES GOVERNMENT MASTER SPECIFICATIONS, PROMULGATED BY THE FEDERAL SPECIFICATIONS BOARD. Circular of the Bureau of Standards No. 319. Department of Commerce. Washington, D. C. Complete to January 1, 1928. 18 pp.

The Federal Specifications Board was established in 1921 for the purpose of coordination and economy in the procurement of material and services used by the Government under specifications prepared in the various branches thereof and to avoid duplication of effort. The compilation and adoption of the various specifications listed in this pamphlet is the result of the Board's efforts over the last seven years. A large number of the items listed are rubber manufactured goods, ranging from rubber aprons to rubber valves. In most cases separate specifications on the individual items are either in mimeographed or circular form and can be obtained through the Superintendent of Documents, Government Printing Office, Washington, D. C. The price of each printed specification is 5 cents per copy. The mimeographed copies are available on request.

OUR WORLD TRADE IN 1927. Value and Volume of Principal Exports and Imports between United States and Chief Foreign Markets. 29th Quarterly Issue. Published by the Foreign Commerce Department. Chamber of Commerce of the United States, Washington, D. C. 32 pp.

The pamphlet embraces a comprehensive resume of the foreign trade of the United States, with carefully prepared analyses and tables. Comparisons with percentages of loss or gain between various periods are also given. The statistics are arranged in a number of new ways to bring out various phases of export conditions which are not usually treated in the United States Department of Commerce analyses.

Tire and Tube Inventories Increase

THE production of automobile casings and inner tubes climbed during February but shipments from the factories fell off, resulting in a marked increase in inventories, according to the report of the Rubber Association of America. The figures released by the Rubber Association represent 75 per cent of the total industry in the United States and have been brought up in the following table to equal 100 per cent.

	February, 1928			January, 1928		
	Prod.	*Ship.*	*Inven.*	*Prod.*	*Ship.*	*Inven.*
PNEUMATIC CASINGS	(All Figures Represent Thousands)					
All types	6,363	5,031	11,721	5,491	5,394	9,949
Balloon	4,029	3,333	5,565	3,170	3,319	4,875
High Pressure Cord	2,263	1,660	5,859	2,246	1,995	4,806
High Pressure Fabric	71	38	297	75	80	268
SOLID AND CUSHION TIRES	48	52	209	48	45	215
INNER TUBES—						
All types	6,895	5,431	14,650	5,441	6.072	12,982
Balloon	4,296	3,470	6,728	3,215	3,386	5,878
High Pressure	2,599	1,961	7,922	2,226	2,686	7,104

Further detailed comparative tables covering previous months with year totals will be found in the statistical section of this issue of THE RUBBER AGE.

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